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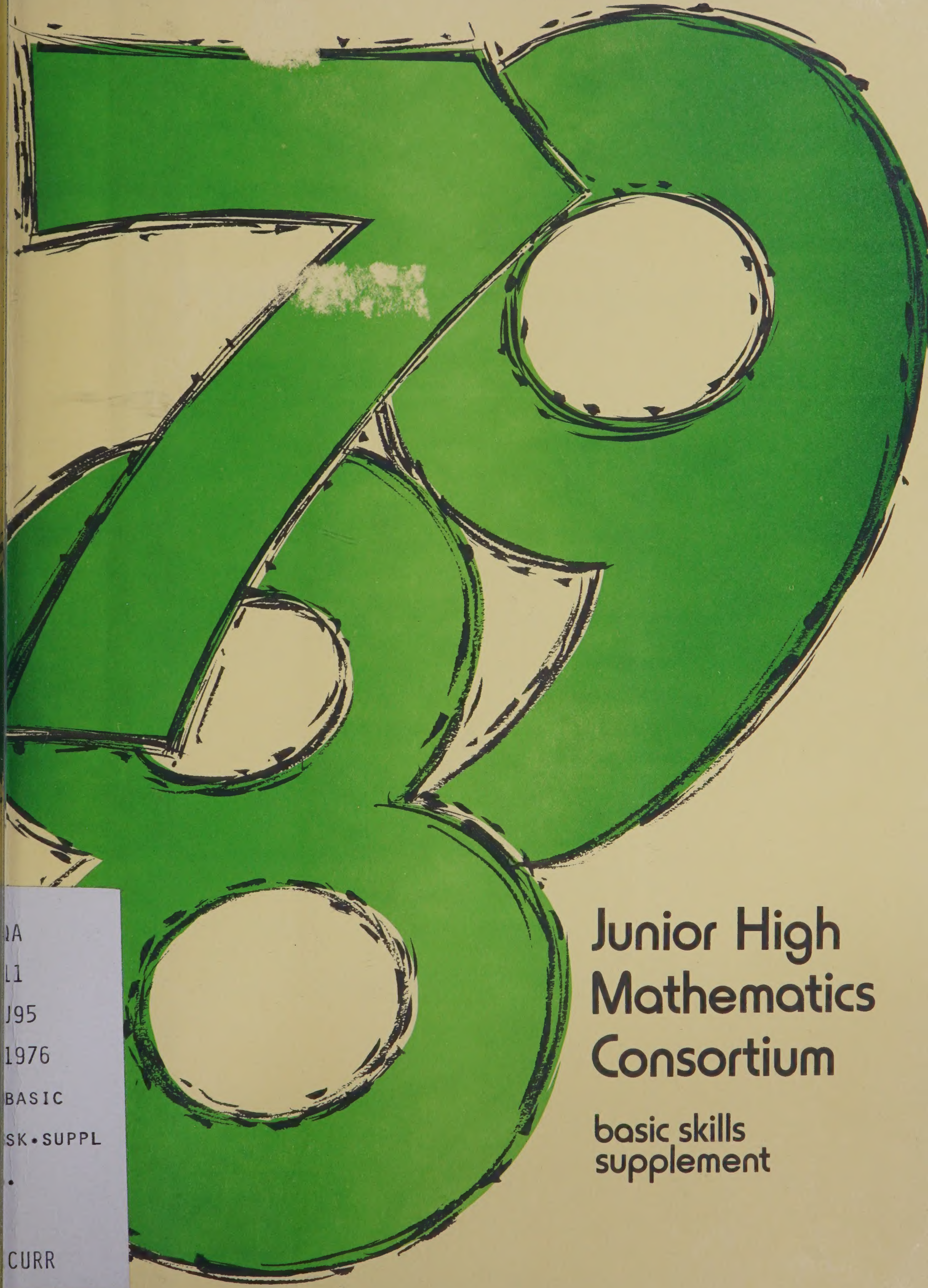

Junior High Mathematics Consortium

basic skills supplement

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JUNIOR HIGH MATHEMATICS CONSORTIUM

BASIC SKILLS SUPPLEMENT

Level Seven

Level Eight

Level Nine

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INTRODUCTION

The Basic Skills Supplement has been developed to provide alternate developmental and motivational exercises, for selected objectives, which may be used with students who are experiencing difficulty.

The Basic Skills Supplement is not a complete program, but is intended for use in conjunction with the regular program.

2698163

JUNIOR HIGH MATHEMATICS CONSORTIUM

MATHEMATICS PROGRAM

This Junior High Mathematics Program has been prepared through the cooperative efforts of the twenty member systems in the Junior High Mathematics Consortium. All the components of the program are related to performance objectives and provide the teacher with a variety of teaching strategies, activities and resources to facilitate the instructional process. The teachers have the opportunity to determine the modes of instruction that best suits them and their students.

For each objective within the program, there is a bank of test items. The items in the bank have been field tested to determine difficulty and reliability and validated by a committee of teachers and curricular coordinators.

The program was made possible through the assistance and cooperation of many individuals. Special thanks and acknowledgments are extended to:

the many teachers who helped design, develop, pilot and revise the program materials;

the publishers for referencing their materials to the performance objectives: Addison-Wesley, Gage Publishing and Holt Rinehart;

The Department of Education, Province of Alberta for partially funding the project;

the administrators, supervisors, consultants and curricular associates from each of the cooperating systems for providing time, money and expertise to the program.

ACKNOWLEDGMENTS

The components of this program have been developed by teachers from the following school systems:

1. Edmonton Public School District #7
2. Edmonton Separate School District #7
3. County of Leduc #25
4. County of Parkland #31
5. St. Albert Protestant Separate School District #6
6. County of Strathcona #20
7. Calgary School District #19
8. Calgary Roman Catholic Separate School District #1
9. Foothills School Division #38
10. County of Vulcan #2
11. County of Ponoka #3
12. Red Deer School District #104
13. Red Deer Roman Catholic Separate School District #17
14. Mountain View County #17
15. Falher Consolidated School District #69
16. Fort McMurray Roman Catholic Separate School District #32
17. Bonnyville School Division #46
18. County of Beaver #9
19. County of St. Paul #19
20. St. Paul School District #2228

WHOLE NUMBERS

LEVEL 7

UNIT II

CONTENTS

Unit II - Whole Numbers

PAGE

OBJECTIVE 3: Write any whole number in expanded form. .... 4.

OBJECTIVE 4: Write any whole number in standard form given the expanded form. .... 9.

OBJECTIVE 5: Perform the operations of addition and subtraction with whole numbers using the following terminology: addends, sum, difference, subtrahend, minuend. .... 14.

OBJECTIVE 6: Perform the operations of multiplication and division with whole numbers using the following terminology: multiplicand, multiplier, product, divisor, dividend, quotient. .... 25.

OBJECTIVE 7: Demonstrate the use of identity elements and the zero property. (De-emphasize terminology) .... 34.

OBJECTIVE 10: Evaluate expressions involving the order of operations. (Limited: expression of the type.) .... 40.

$$7 + 5 - 4 - 3 \times 1 =$$

OBJECTIVE 11: Use symbols and notation illustrated below. .... 47.

a. Multiplication

(i) $3 \times 4 = (3)(4) = 3(4)$
(ii) $3x = (3)(x) = 3(x)$

b. Division

(i) $\frac{9}{3} = 9 \div 3 = 3\overline{)\,9}$
(ii) $\frac{x}{9} = x \div 9 = 9\overline{)\,x}$

OBJECTIVE 12: Evaluate expressions by substituting for the variable. (Limit: whole numbers and one variable.) .... 49.

Unit II - Whole Numbers (cont'd.)

PAGE

OBJECTIVE 13: Solve conditions for equality using an informal approach for the following types. (Limits: whole numbers) .... 53.

a. $A + x = b$
c. $Ax + B = C$
b. $Ax = B$
d. $Ax + Bx = C$

Note: Make sure you check the level of difficulty before having students use an informal approach.

OBJECTIVE 14: Verify solutions of conditions by substitution .... 56.

OBJECTIVE 15: Use some formalized approach to solving conditions, (e.g. flow charts, related number sentences). .... 58.

e.g. $A + x = B$

$x = B - A$

OBJECTIVE 17: Write mathematical sentences for English sentences. .... 61.

OBJECTIVE 18: Solve problems using any organized approach. .... 67.

e.g. $(\frac{3}{4} \times \frac{4}{5} + \frac{6}{12} \div \frac{3}{4} = \ )$

KEY TO EXERCISES: .... 73.

A. Let's Expand

There was an old woman
Who lived in a shoe.
Her family

E
___ ___ ___ ___ ___ ___ ___ ___
5 10 8 6 3 100 4 10

so rapidly
She didn't know what to do.

To complete the nursery rhyme:

1. Fill in the missing numbers below.
2. Place the letter corresponding to each number in the proper place in the blanks above.

NOTE: The first one is done for you. A letter can be used more than once.

5 = (5 x 1)
E

45 = (___ x 10) + (5 x 1)
E

237 = (2 x 100) + (___ x 10) + (7 x 1)
N

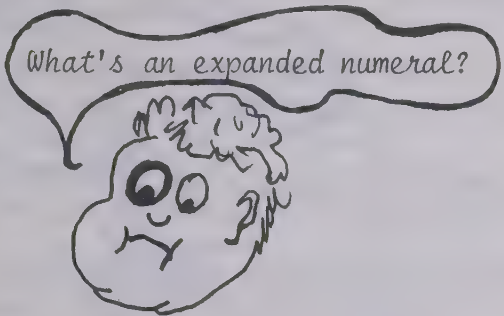
639 = (6 x 100) + (3 x ___) + (9 x 1)

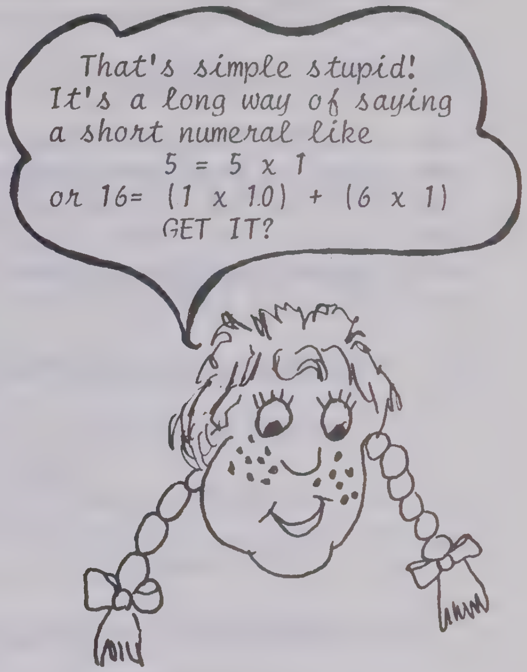
758 = (7 x 100) + (5 x 10) + (___ x 1)
P

303 = (3 x ___) + (0 x 10) + (3 x 1)
D

76 = (7 x 10) + (___ x 1)
A

B.


What's an expanded numeral?


That's simple stupid! It's a long way of saying a short numeral like 5 = 5 x 1 or 16= (1 x 10) + (6 x 1) GET IT?

See if you can get these too. Expand the following numerals.

1. 7 ______________________________

2. 18 ______________________________

3. 73 ______________________________

4. 114 ______________________________

5. 259 ______________________________

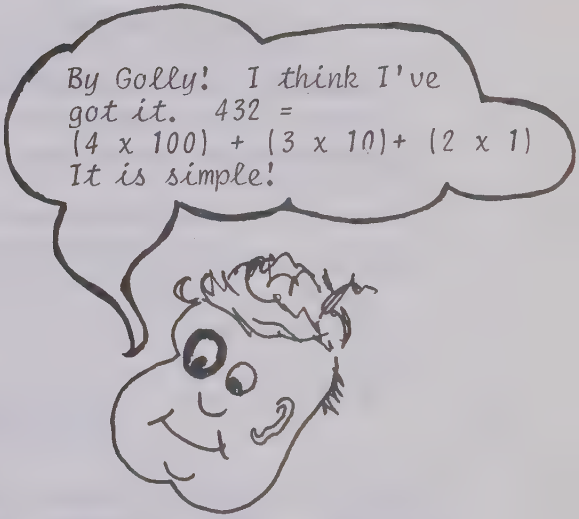
6. 903 ______________________________

7. 1 231 ______________________________

8. 9 682 ______________________________

9. 876 ______________________________

10. 50 ______________________________


By Golly! I think I've got it. 432 = (4 x 100) + (3 x 10)+ (2 x 1) It is simple!

C.

A LOT OF BULL

What word would you use to describe a bull that had just swallowed a bomb?

To find the answer, write the value of each underlined digit in the space to the right of it. Then match the letter of each answer with the answers at the bottom of the page. The first one is done for you.

e.g. The value of 7 in 5 472 is 10
The value of 5 in 35 461 is 1000

m. 976 352 ____________________

a. 57 ______________

o. 245 ______________

b. 45 379 ______________

e. 75 321 459 ______________

l. 3 401 672 ______________

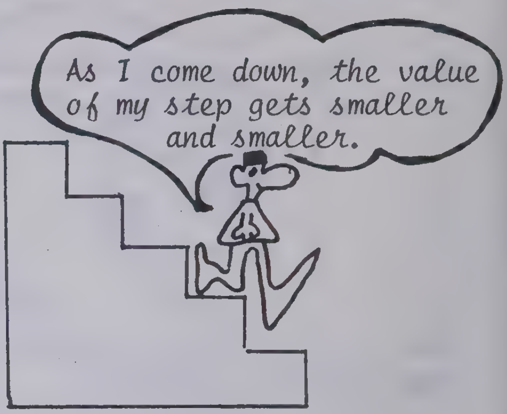
n. 543 ______________

i. 178 934 ______________

1 10 000 100 1 000 100 000 10 1 10 000 1 000 000 10 000 000

_ ______ ___ M ______ __ _. ______ ______ __ ______

D. Watch that Step!


As I come down, the value of my step gets smaller and smaller.

As one walks down the steps at right the value of each step is decreased. The top step has a value of 1 000 000 or 10 x 10 x 10 x 10 x 10 x 10. The step second from the top has a value of 100 000 or 10 x 10 x 10 x 10 x 10.

1. What is the value of the step that is:

   a. third from top? ____________ or ______________

   b. fourth from top? _________ or ______________

   c. fifth from top? __________ or _______________

   d. sixth from top? _________

   e. seventh from top? ________

2. Imagine the steps are like the boxes below. Fill in the missing values by following the pattern set for you.

1 000 000		1 000			
	10 x 10 x 10 x 10		10 x 10	10	1

E. THAT'S THE WAY THE BALL BOUNCES!

In each of the following statements an important basketball statistic is given. Each statement involves a numeral or numerals. Write an expanded numeral for the numerals in each statement.

e.g. In his senior year at the University of Houston, Elvin, "Big E" Hayes averaged almost 37 points per game.

37 = (3 x 10) + (7 x 1)

1. Bob Cousy, the greatest playmaker of all time, had 937 assists in playoff competition, more than any other player in history.

937 =

2. In 1972 N.B.A. All-Star game resulted in a thrilling 108-107 win for the West Stars.

a. 1972 = ________

b. 108 = ________

c. 107 = ________

3. Wilt Chamberlain holds the professional record for most shots attempted in one game with 63!

4. The all-time record for most rebounds in a playoff game is 40 by Bill Russell, who performed the feat twice.

5. The first player in pro-history to score 2 000 points in one season was George Yardley, of the Old Fort Wayne Pistons.

6. Philadelphia's Spectrum, once a nightmare for visiting teams, has a seating capacity of 15 332 people.

7. A total of 83 796 shots were attempted in the 1972 A.B.A. season.
a.
b.

F.

WORD EXPANSION IN HOCKEY HISTORY

In each of the following statements about hockey, write a name for each of the numerals in the statement.

For example, Phil Exposito scored 35 goals during the 1967-1968 season.

35 = thirty five
1967 = one thousand, nine hundred , sixty-seven
1968 = one thousand, nine hundred, sixty-eight

1. On January 23, 1944 the Detroit Red Wings scored 15 consecutive goals and defeated the New York Rangers.

2. Top vote getter among all players chosen for the 1973 N.H.L. All Star team was goalie Ken Dryden, who received 239 votes.

3. Entering the 1972-1973 regular season, veteran Eddie Shack had appeared in 888 games, not including playoffs.

4. Goalie Glenn Hall once played 502 consecutive games for the Red Wings and Black Hawks to set an all time record!

5. The smallest crowd to watch an N.H.L. All Star game was 9 166 in 1950.

6. Gordie Howe was not only one of the greatest scorers in N.H.L. history, before starring the the W.H.A. but his 1 605 penalty minutes also proved he was one of the toughest players in the game.

7. Quebec Coliseum, home of the W.H.A. Quebec Nordiques, has a seating capacity of 10 014.

8. A sell-out Moscow crowd of 15 000 people watched as Canada's Paul Henderson scored the winning goal in the September 28, 1972 final game of the historic Canadian-Russian hockey showdown.

9. The radio broadcasting rights for the historic series mentioned in #8 were sold to the network for $87 500.

10. The Stanley Cup Champion in 1972 reportedly had a total of 52 546 dollars to divide evenly among players.

EXERCISES: UNIT II OBJECTIVE NO. 4

A. *A Wholly Matter*

The picture at the right is a close-up of a familar object. To discover what the object is, match each expression in Column A with an equivalent expression in Column B. Then place the letter corresponding to the number in its proper place in the code at the bottom of the page.

The first one is done for you.

A Familiar Object

	Column A		Column B
1.	67	T	89
2.	(6x100) + (0x10) + (8x1)	U	seventy-five
3.	808	H	one hundred fifty-three
4.	eighty-nine	D	twenty thousand fifty-four
5.	392	E	(4x1 000) + (7x100) + (8x10) + (2x1)
6.	(7x10) + (5x1)	A	(8x100) + (0x10) + (8x1)
7.	(1x100) + (5x10) + (3x1)	C	(3x100) + (9x10) + (2x1)
8.	4 782	F	608
9.	99	N	(6x10) + (7x1)
10.	20 054	O	Four thousand five hundred, sixty-nine
11.	4 569	R	(9x10) + (9x1)

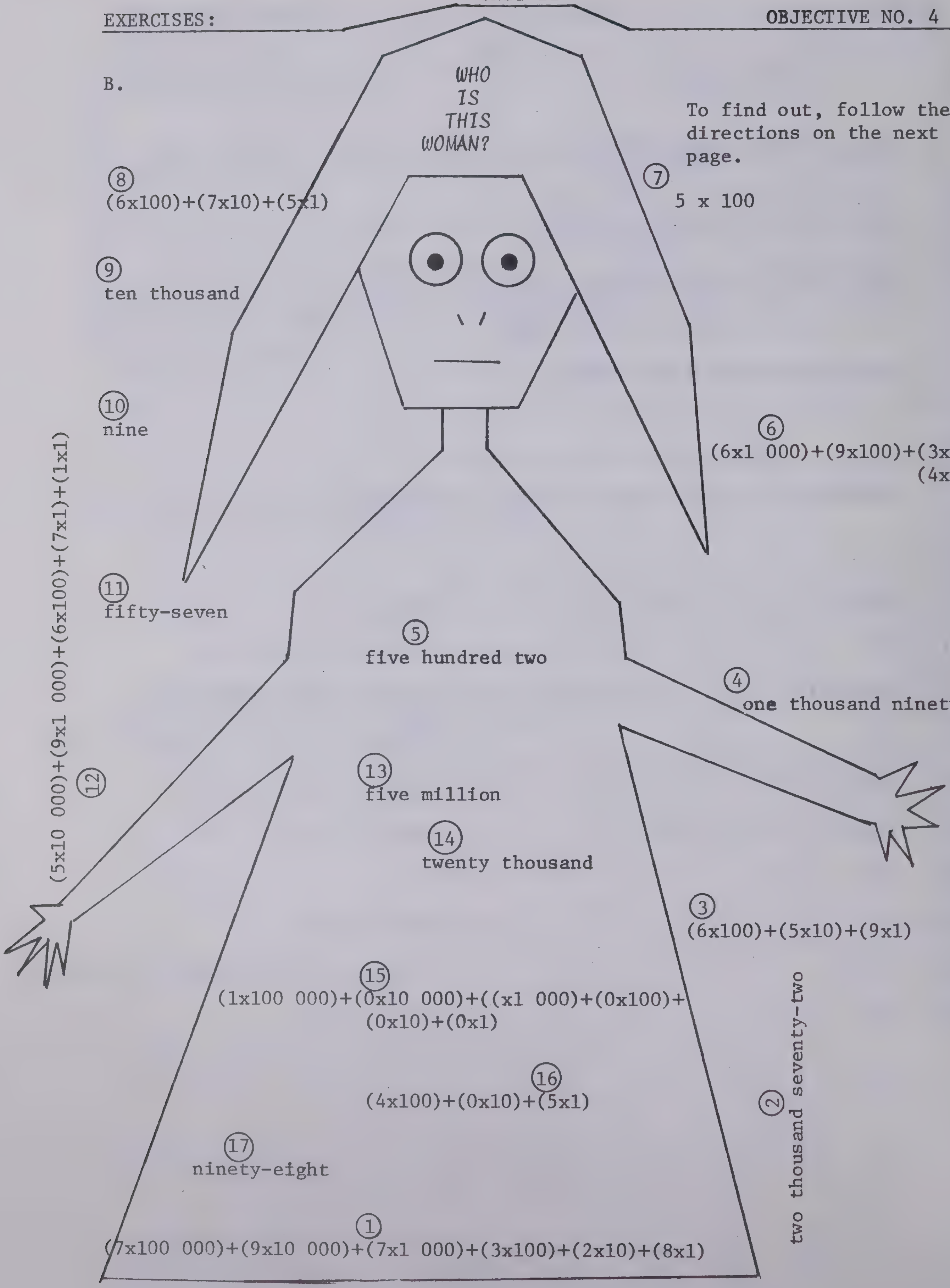
___	___	___		___	___	N	___	___	___		___	___
4	7	8		5	8	1	4	9	8		11	2

___		___	___	N	___	___
3		10	11	1	6	4

UNIT II

EXERCISES: OBJECTIVE NO. 4

B.



WHO IS THIS WOMAN?

To find out, follow the directions on the next page.

① (7x100 000)+(9x10 000)+(7x1 000)+(3x100)+(2x10)+(8x1)

② two thousand seventy-two

③ (6x100)+(5x10)+(9x1)

④ one thousand ninety

⑤ five hundred two

⑥ (6x1 000)+(9x100)+(3x10)+(4x1)

⑦ 5 x 100

⑧ (6x100)+(7x10)+(5x1)

⑨ ten thousand

⑩ nine

⑪ fifty-seven

⑫ (5x10 000)+(9x1 000)+(6x100)+(7x1)+(1x1)

⑬ five million

⑭ twenty thousand

⑮ (1x100 000)+(0x10 000)+((x1 000)+(0x100)+(0x10)+(0x1)

⑯ (4x100)+(0x10)+(5x1)

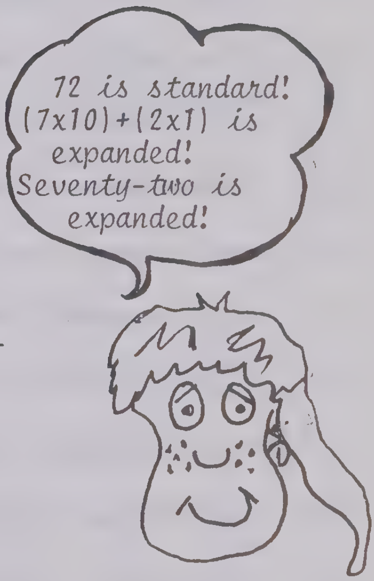
⑰ ninety-eight

EXERCISES: UNIT II OBJECTIVE NO. 4

To find out who this mysterious lady is, write out in standard form a numeral for each of the expanded numerals in the picture. The sum of these numerals is the answer to the lady's identity.

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
13. ____________________
14. ____________________
15. ____________________
16. ____________________
17. ____________________
18. (sum) ____________________

The $ ________________ Woman!


72 is standard! (7x10)+(2x1) is expanded! Seventy-two is expanded!

C. Write standard numerals for each of the following expanded numerals.

1. (5 x 10) + (6 x 1) = ____________________

2. (4 x 100) + (2 x 10) + (7 x 1) = ____________________

3. (9 x 10) + (1 x 1) = ____________________

4. (6 x 1 000) + (5 x 100) + (3 x 10) + (6 x 1) = ____________________

5. (8 x 1 000) + (9 x 100) + (2 x 10) + (0 x 1) = ____________________

6. (1 x 10 000) + (8 x 1 000) + (7 x 100) + (4 x 10) + (9 x 1) = ____________

7. (2 x 1 000) + (5 x 100) + (1 x 10) + (1 x 1) = ____________________

8. (5 x 100) + (9 x 10) + (9 x 1) = ____________________

9. (7 x 1 000) + (5 x 100) + (0 x 10) + (3 x 1) = ____________________

10. (8x100 000) + (9x10 000) + (6x1 000) + (6x100) + (7x10) + (9x1)= ________

11. two thousand six = ______________________________

12. five hundred ninety seven = ______________________________

13. (1 x 10 000) + (2 x 1 000) + (3 x 100) + (4 x 10) + (5 x 1) = ____________

14. five million, eighty-six thousand = ____________________________

15. two hundred eleven = _________________________

16. (5 x 100) + (0 x 10) + (9 x 1) = _______________________

17. ninety-nine thousand, three hundred forty-two = _____________________

18. (7 x 1 000) + (1 x 100) + (6 x 10) + (5 x 1) = ____________________

19. ten million, five hundred thousand, one hundred five = ________________

20. (8 x 1 000) + (7 x 100) + (6 x 10) + (9 x 1)= ________________________

D. *What animal is like an expanded numeral?*

To find out, write in the answers to the following questions. The answers are in the puzzle at the bottom of the page. Shade in the areas that contain the answers to the questions.

1. (7 x 10) + (3 x 1) = ______________________

2. (9 x 100) + (3 x 10) + (7 x 1) = ______________________

3. (8 x 1 000) + (7 x 100) + (9 x 10) + (5 x 1) = ______________________

4. (5 x 10) + (7 x 1) = ______________________

5. (5x10 000) + (1x1 000) + (1x100) + (2x10) + (0x1) = ______________________

6. (9 x 1) = ______________________

7. (7 x 1 000) + (9 x 100) + (6 x 10) + (3 x 1) = ______________________

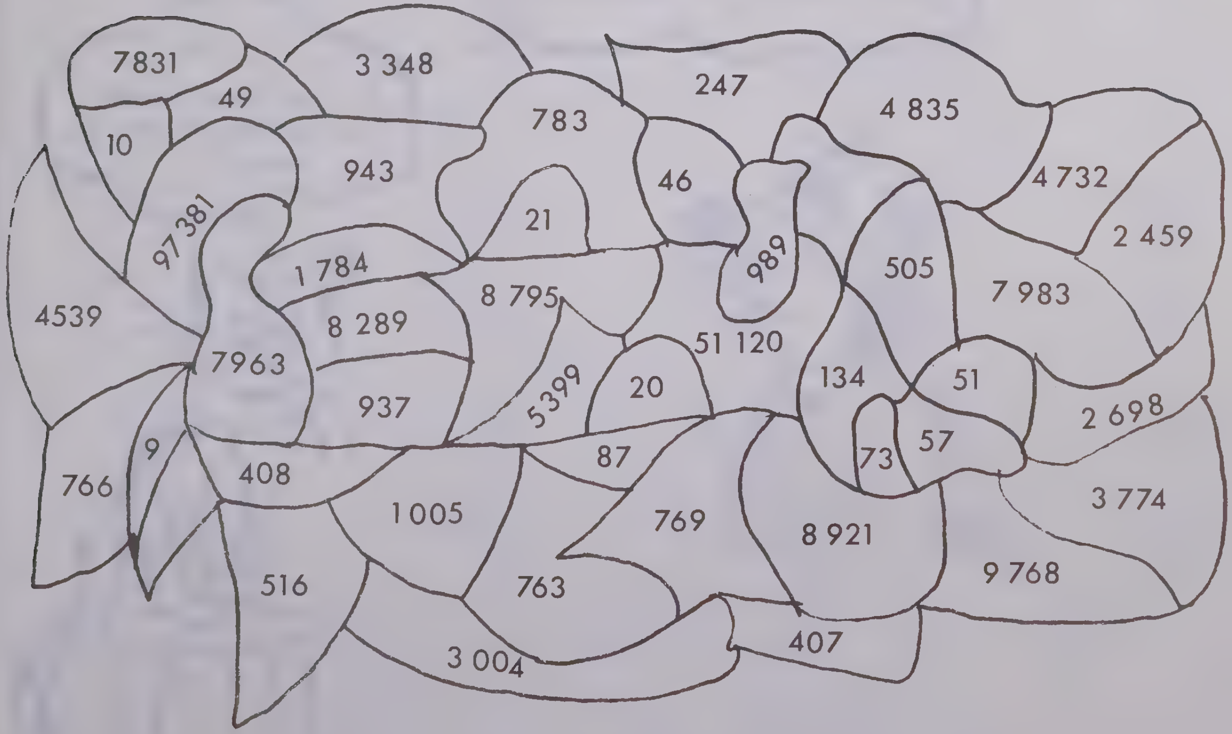
8. (5x10x10x10) + (3x10x10) + (9x10) + (9x1) = ______________________

9. (2 x 10) + (0 x 1) = ______________________

10. (9 x 100) + (8 x 10) + (9 x 1) = ______________________

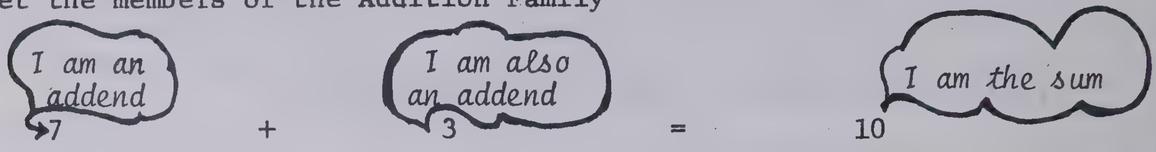
11. (8x10x10x10) + (2x10x10) + (8 x 10) + (9 x 1) = ______________________

12. (1 x 100) + (3 x 10) + (4 x 1) = ______________________



EXERCISES: UNIT II OBJECTIVE NO. 5

A. Meet the members of the Addition Family



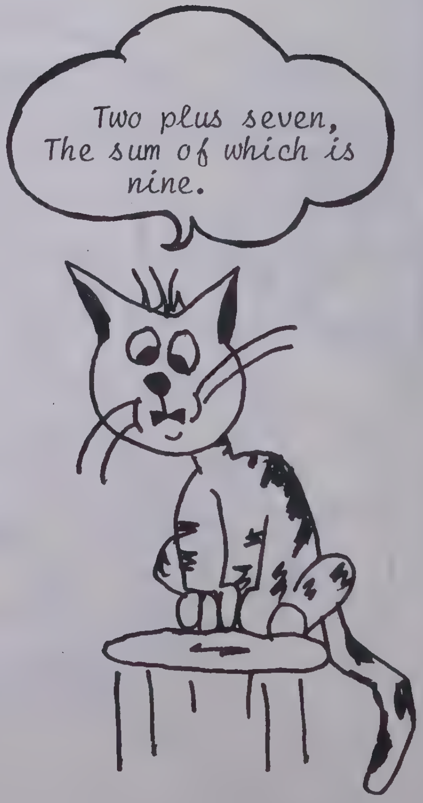
7 + 3 = 10

Supply the missing addend or sum in each of the following and tell whether it is a sum or an addend.

e.g. 5 + 12 = 17 sum

1. 7 + ____________ = 16 ____________
2. 5 + 8 + 9 = ____________ ____________
3. 17 + 15 + ________ = 37 ____________
4. 82 + 56 = ____________ ____________
5. 136 + 45 = ____________ ____________

Twelve plus nine, the sum of which is twenty-one.


Two plus seven, The sum of which is nine.

EXERCISES: UNIT II OBJECTIVE NO. 5

B. What did the sums below say to the addends? Find the sums. Then match the word beside each sum with the sum at the bottom of the page and get the answer!

1. 3 + 6 + 5 + 8 = ________________________________ (be)
2. 8 + 3 + 7 + 9 + 11 = ____________________________ (I)
3. 7 + 9 + 8 + 5 + 8 = ______________________________ (will)
4. 9 + 9 + 6 + 4 + 2 = ______________________________ (big)
5. 8 + 6 + 3 + 9 + 7 = ______________________________ (am)
6. 7 + 6 + 9 + 3 + 2 = ______________________________ (You)
7. 5 + 4 + 3 + 2 + 9 = ______________________________ (as)
8. 7 + 8 + 9 + 6 + 5 = ______________________________ (never)

________ 27 ________ 37 ________ 35 ________ 22 ________ 23 ________ 30

________ 23 ________ 38 ________ 33 !

C. SUM FUN

1.	a) 15 +4	b) 12 +7	c) 17 +2	d) 27 +2	e) 54 +3
	f) 88 +1	g) 96 +3	h) 84 +5	i) 92 +6	j) 57 +2
2.	a) 54 +12	b) 92 +16	c) 54 +14	d) 73 +15	e) 84 +15
	f) 76 +13	g) 81 +23	h) 26 +13	i) 47 +12	j) 78 +11
3.	a) 154 +23	b) 198 +21	c) 476 +53	d) 761 +25	e) 481 +23
	f) 678 +52	g) 491 +27	h) 883 +26	i) 472 +38	j) 642 +56

4. a) 92 +9 b) 59 +7 c) 68 +9 d) 42 +9 e) 96 +7

f) 42 +8 g) 58 +7 h) 79 +8 i) 54 +8 j) 63 +9

5. a) 54 + 19 = b) 96 + 17 = c) 95 + 16 = d) 41 + 97 =

e) 47 + 98 = f) 69 + 54 = g) 48 + 76 = h) 97 + 19 =

i) 55 + 76 = j) 40 + 59 =

6. a) 998 + 77 = b) 576 + 89 = c) 692 + 89 = d) 716 + 87 =

e) 315 + 78 = f) 213 + 78 = g) 123 + 79 = h) 432 + 97 =

i) 618 + 75 = j) 437 + 95 =

7. a) 476 + 895 = b) 488 + 132 = c) 967 + 897 = d) 459 + 675 =

e) 835 + 419 = f) 578 + 869 = g) 745 + 869 = h) 482 + 969 =

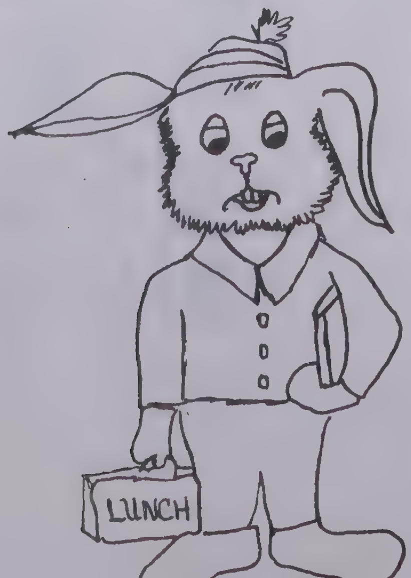
i) 783 + 394 = j) 581 + 298 =

8. a) 8 716 + 2 213 = b) 7 815 + 1 349 = c) 5 780 + 2 983 =

d) 8 542 + 1 698 = e) 7 182 + 2 349 = f) 8 653 + 9 862 =

g) 9 211 + 1 548 = h) 3 769 + 1 296 = i) 1 279 + 8 321 =

j) 5 409 + 2 985 =



D. *What's the difference between your math text and your math teacher?*

The answer to this riddle is written in code at the bottom of the page. To break the code, work any problem and find the answer in the code. Each time the answer appears in the code you must write the word of the problem above it.

11 + 12 = 23 (teacher)

42 + 21 = 63 (up)

35 + 50 = [illegible] (as)

19 + 17 = 36 (math)

89 + 73 = 162 (easy)

105 + 111 = 216 (is)

12 + 14 = 26 (text)

36 + 41 = 77 (your)

14 + 16 = ~~[illegible]~~ 30 (shut)

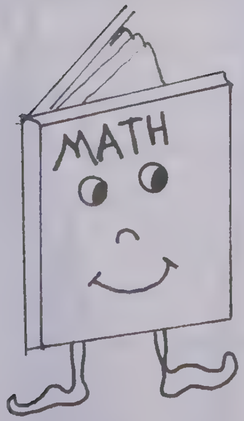
27 + 25 = 52 (it)

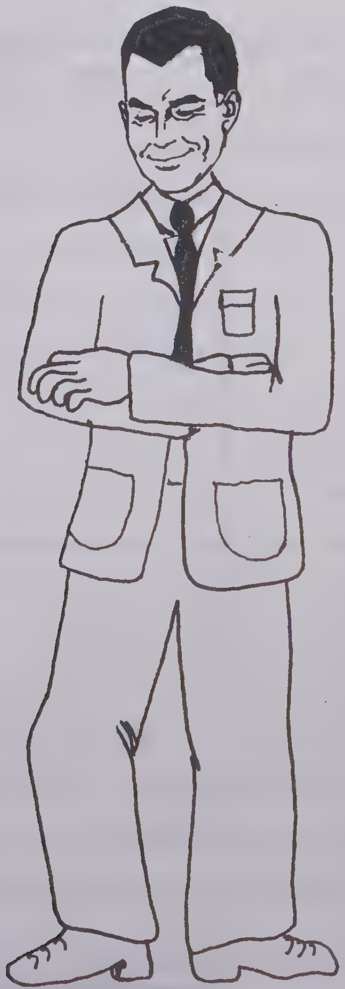
58 + 85 = 143 (not)

114 + 103 = 217 (to)

it	is	[illegible]	to	shut	up	your	math	text
52	216	162	217	30	63	77	36	26 .

it	is	not	as	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] !
52	216	143	85	162	217	30	63	77	36	23





E.

A $ $ $ $ MATTER

Mr. Thrift Tee sets aside $30 of his weekly earnings every week for groceries. Last week he purchased the following items.

1 bag of flour	- $2.00	1 sack of onions	- $2.00
1 bag of sugar	- $3.00	2 bricks of butter	- $3.00
1 can of coffee	- $2.00	3 doz. eggs	- $3.00
1 box of apples	- $5.00	1 carton of milk	- $3.00
1 bag of cookies	- $1.00	1 can of peanuts	- $5.00
5 loaves of bread	- $1.00	1 carton of ice cream	- $2.00

Enter these purchases on the form provided,
Find their sum _________.
Did Mr. Thrift Tee spend more than or less than $30 last week? ___________

Bob's Super A Store

Box 30, Glendon, Alberta

PHONE 635-3870

Date ...., 19 ....

M ______________________________

Account Forward

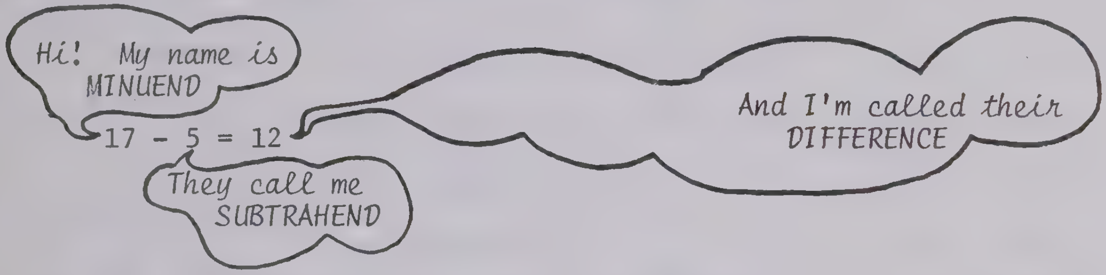
Date	Item	Price		Signature
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
I				

Accounts Subject to 1% per month Service Charge.

F.

THE SUBTRACTION FAMILY

Can you think of a humorous title for this picture? The title is the secret to a good garden.



Identify the members of the subtraction family that are underlined. Then match the letter beside your answers to the answers beside the picture.

1. 53 - 22 = 31   2. 788 - 213 = 505   3. 69 - 45 = 24

____ ____ ____
o e h

____ difference ____ minuend ____ subtrahend

____ difference ____ minuend ____ subtrahend

____ difference ____ minuend ____ subtrahend

G.

WHAT'S THE DIFFERENCE?

1. a) 57 - 3 = b) 99 - 9 =
c) 76 - 5 = d) 54 - 2 =
e) 79 - 8 = f) 88 - 7 =
g) 59 - 3 = h) 93 - 2 =
i) 75 - 4 = j) 87 - 5 =

2. a) 478 - 23 = b) 574 - 63 =
c) 318 - 15 = d) 472 - 41 =
e) 592 - 31 = f) 276 - 15 =
g) 577 - 67 = h) 345 - 12 =
i) 839 - 17 = j) 962 - 51 =

3. a) 478 - 214 = b) 639 - 128 =
c) 293 - 132 = d) 598 - 397 =
e) 616 - 302 = f) 782 - 541 =
g) 579 - 158 = h) 333 - 213 =
i) 766 - 545 = j) 818 - 213 =

4. a) 90 - 8 = b) 57 - 9 =
c) 66 - 8 = d) 44 - 5 =
e) 37 - 9 = f) 50 - 9 =
g) 83 - 8 = h) 68 - 9 =
i) 53 - 7 = j) 92 - 8 =

G.

5. a) 57 - 39 = b) 63 - 45 =

c) 43 - 39 = d) 82 - 63 =

e) 42 - 16 = f) 75 - 38 =

g) 23 - 16 = h) 40 - 27 =

i) 63 - 14 = j) 95 - 17 =

6. a) 419 - 38 = b) 716 - 43 =

c) 518 - 29 = d) 462 - 93 =

e) 778 - 97 = f) 857 - 99 =

g) 213 - 48 = h) 456 - 65 =

i) 478 - 99 = j) 854 - 87 =

7. a) 859 - 368 = b) 478 - 389 =

c) 281 - 195 = d) 423 - 354 =

e) 726 - 598 = f) 419 - 273 =

g) 836 - 548 = h) 432 - 393 =

i) 728 - 159 = j) 444 - 389 =

H.

ALL KINDS OF DIFFERENCES!

1. 2 134 - 7 = 2. 3 796 - 8 =

3. 5 102 - 4 = 4. 8 000 - 4 =

5. 1 769 - 63 = 6. 2 528 - 92 =

7. 4 154 - 25 = 8. 7 100 - 86 =

9. 2 843 - 216 = 10. 9 398 - 569 =

11. 8 000 - 476 = 12. 4 560 - 264 =

13. 9 369 - 449 = 14. 4 720 - 851 =

15. 6 146 - 939 = 16. 7 821 - 6 215 =

17. 5 789 - 4 398 = 18. 47 892 - 12 345 =

19. 7 892 - 1 987 = 20. 4 186 - 2 398 =

I.

A CHAIN PROBLEM

This is a chain problem. Do the steps in order from left to right. Place your answer in the circle at the right. When you have completed all eight parts, find the sum of all your answers.

1. Take 3 — Subtract 1 from it — Add 9 to the difference — Subtract 5 from the sum = ______

2. Take 6 — Add 7 to it — Subtract 8 from the sum — Add 5 to the difference = ______

3. Take 15 — Subtract 15 from it — Add 92 to the difference — Add 8 to the sum = ______

4. Take 102 — Add 147 to it — Subtract 99 from your sum — Subtract 95 from the difference = ______

5. Take 1 054 — Subtract 174 from it. — Subtract 92 from the difference — Add 44 to the difference = ______

6. Take 7 619 — Add 274 to it — From the sum subtract 783 — From the difference subtract 2 017 = ______

7. Take 9 937 — Subtract 8 309 from it — Add 6 782 to the difference — Add 973 to the sum = ______

8. Take 30 004 — Add 785 to it — Subtract 9 789 from the sum — Subtract 3 000 from the difference = ______

THE GRAND SUM IS ______________

J. *What is a familiar sign of our times?*

Answer the questions below. Then find the answers among the dots on the next page and connect them in the order they are numbered.

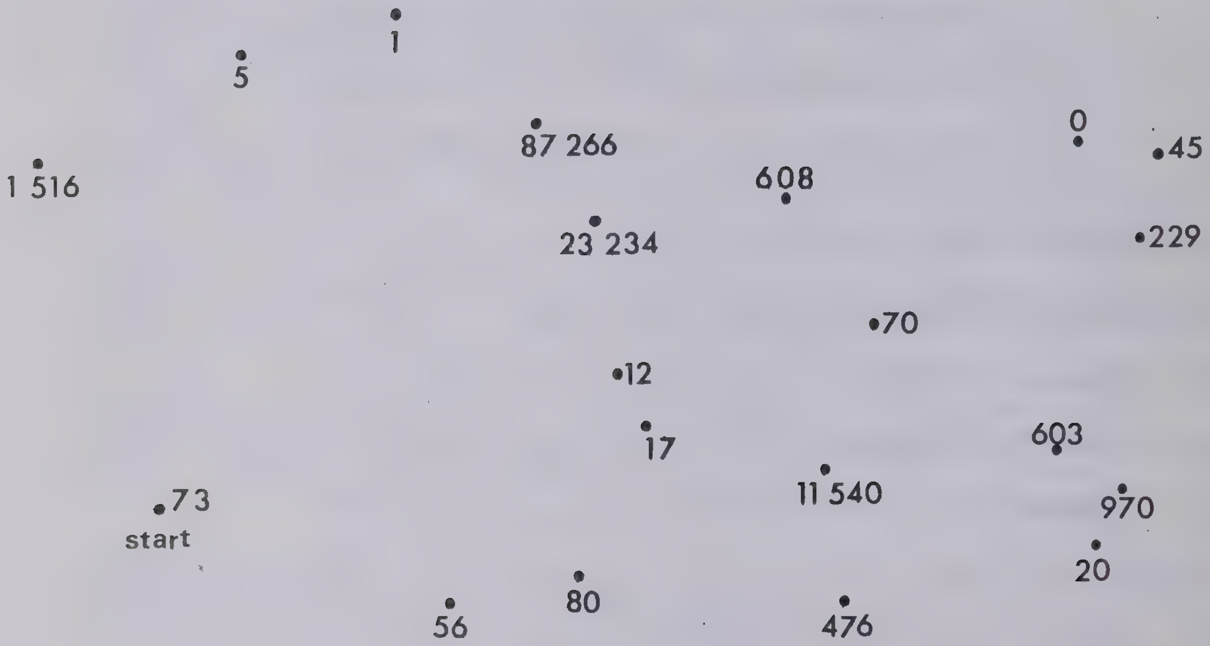
e.g. 1. The first addend in 534 + 728 = 1 262 is 534

2. The minuend in 758 - 326 = 432 is 758

3. The subtrahend in 112 - 90 = 22 is 90

4. The sum in 274 + 132 = 406 is 406

1. The sum of 7 and 12 and 54 is __________.
2. The minuend in 56 - 32 = 24 is __________.
3. The difference between 91 and 11 is __________.
4. The largest addend in 476 + 378 + 73 is __________.
5. The subtrahend in 75 - 20 = 55 is __________.
6. The sum of 693 and 277 is __________.
7. The minuend in 603 - 274 = 329 is __________.
8. The sum of 2 174, 3 152 and 6 214 is __________.
9. The difference between your answers in #1 and #2 is __________.
10. The smallest addend in 544 + 12 + 96 is __________.
11. What is the difference between the following sums: (54 + 99) and (13 + 70) ? __________
12. Which of these three numerals would be the difference of the other two. 876, 229, 647 __________
13. The sum of 1 + 2 + 3 +4 + 5 + 6 + 7 + 8 + 9 is __________.



14. What numeral can be added many times but still has a sum equal to its addends? ______________

15. Which of these two numerals 578 and 608 would be the minuend? __________

16. The sum of 7 813 and 15 421 is ____________

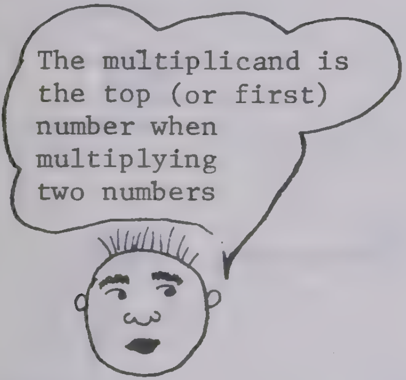
17. The difference between 90 034 and 2 768 is _____________

18. Which digit in the subtrahend of 789 - 123 has a value of 100?

19. In the sum of 648, 386 and 4 573 which digit has a value of 1 000? ______

20. The sum of the minuend in 547 - 63 = 484 and the minuend in 969 - 372 is __________.

I Multiplication

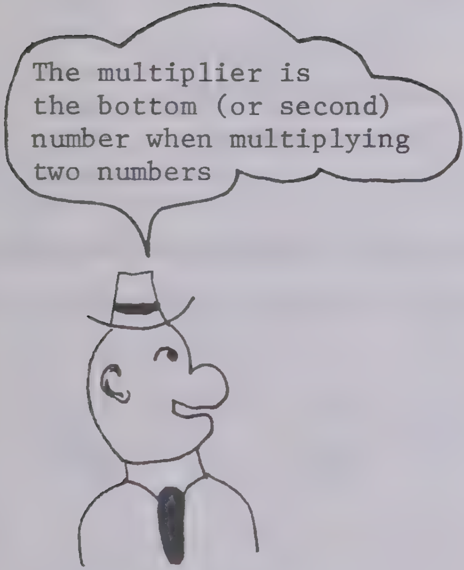

The multiplicand is the top (or first) number when multiplying two numbers

Ex. 1. 71←multiplicand
x 4
284

OR 71 x 4 = 284
↑
multiplicand

Ex. 2. 7←multiplicand
x5
35

OR 7 x 5 = 35
↑
multiplicand

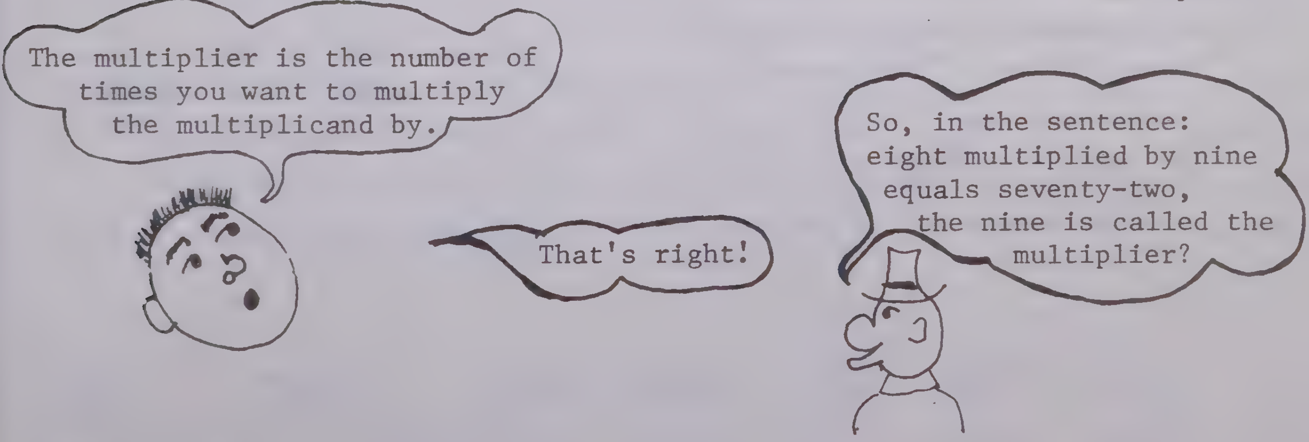

The multiplier is the bottom (or second) number when multiplying two numbers

Ex. 1. 71
x4←multiplier
284

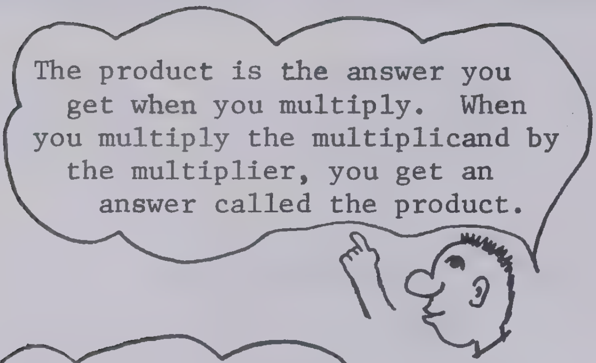
OR 71 x 4 = 284
↑
multiplier

Ex. 2. 7
x5←multiplier
35

OR 7 x 5 = 35
↑
multiplier


The multiplier is the number of times you want to multiply the multiplicand by.
That's right!
So, in the sentence: eight multiplied by nine equals seventy-two, the nine is called the multiplier?

6 - 2

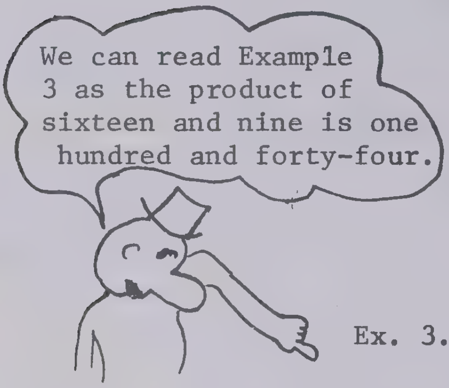

The product is the answer you get when you multiply. When you multiply the multiplicand by the multiplier, you get an answer called the product.

Ex.1.

$$\begin{array}{r} 71 \\ \times 4 \\ \hline 284 \end{array} \leftarrow \text{product}$$

OR

$$\underset{\uparrow\ \text{product}}{71 \times 4 = 284}$$


We can read Example 3 as the product of sixteen and nine is one hundred and forty-four.

Ex. 2.

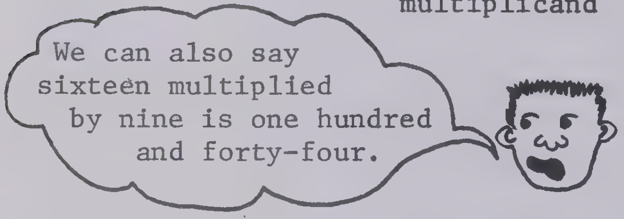
$$\begin{array}{r} 7 \\ \times 5 \\ \hline 35 \end{array} \leftarrow \text{product}$$

OR

$$\underset{\uparrow\ \text{product}}{7 \times 5 = 35}$$

Ex. 3.

$$\underset{\text{multiplicand}}{\underset{\uparrow}{16}} \times \overset{\text{multiplier}}{\overset{\downarrow}{9}} = 144 \leftarrow \text{product}$$


We can also say sixteen multiplied by nine is one hundred and forty-four.

OR

$$\begin{array}{r l} 16 & \leftarrow \text{multiplicand} \\ \times 9 & \leftarrow \text{multiplier} \\ \hline 144 & \leftarrow \text{product} \end{array}$$

Note:

$$\begin{array}{r} \textit{multiplicand} \\ \times\ \textit{multiplier} \\ \hline \textit{product} \end{array}$$

or multiplicand x multiplier = product

Reminder:

One times a number is the number.

Ex. 1. $1 \times 64 = 64$

Ex. 2. $92 \times 1 = 92$

Ex. 3.

$$\begin{array}{r} 55 \\ \times 1 \\ \hline 55 \end{array}$$

Ex. 4.

$$\begin{array}{r} 1 \\ \times 38 \\ \hline 38 \end{array}$$

Reminder:

Zero times any number is zero.

Ex. 1 $0 \times 49 = 0$

Ex. 2 $17 \times 0 = 0$

Ex. 3

$$\begin{array}{r} 55 \\ \times 0 \\ \hline 0 \end{array}$$

Ex. 4

$$\begin{array}{r} 0 \\ \times 63 \\ \hline 0 \end{array}$$

A. Determine which of the following numbers is the multiplicand, multiplier, and product.

1.
35 ← a) multiplicand
x 4 ← b)
140 ← c)

2.
91 ← a)
x 8 ← b) multiplier
728 ← c)

3. 16 x 39 = 624 product
↑a) ↓b) (39) ↑c) (624)

4. 23 x 121 = 1 783
↑a) ↓b) (121) ↑c) (1 783)

5.
283 ← c)
67 ← b)
16 961 ← a)

6. 495 x 56 = 27 720
↑a) ↓b) (56) ↑c) (27 720)

Communicating with Fish?

B. How can you communicate with fish? To find the answer, solve the following code. Find the product of each question below. Beside each question you will find a letter. Write the letter of the question above its correct answer in the code.

When finding the product of each question, write the multiplicand first (or on top) and the multiplier below the multiplicand.

A, If the multiplicand is 77 and the multiplier is 8, the product is ________

N, If the multiplicand is 54 and the multiplier is 9, the product is ________

O, If the multiplicand is 48 and the multiplier is 5, the product is ________

M, If the multiplicand is 367 and the multiplier is 13, the product is ________

P, If the multiplicand is 819 and the multiplier is 64, the product is ________

E, If the multiplicand is 830 and the multiplier is 100, the product is ________

H, If the multiplier is 9 and the multiplicand is 27, the product is ________

U, If the multiplier is 10 and the multiplicand is 809, the product is ________

I, If the multiplier is 11 and the multiplicand is 242, the product is ________

E, If the multiplier is 28 and the multiplicand is 51, the product is ________

O, If the multiplier is 91 and the multiplicand is 45, the product is ________

Y, If the multiplier is 36 and the multiplicand is 72, the product is ________

T, If the multiplicand is 310 and the multiplier is 24, the product is ________

R, If the multiplier is 86 and the miltiplicand is 46, the product is ________

L, If the multiplier is 67 and the multiplicand is 208, the product is ________

D, If the multiplicand is 622 and the multiplier is 30, the product is ________

____	____		____	____	____	____	____	
2 592	4 095		8 090	18 660	3 956	240	52 416	
____	____	____	____	____	____	____	____	____ .
7 440	243	1 428	4 771	616	13 936	2 662	486	83 000

C. HOW WELL DO YOU KNOW YOUR HOCKEY STATISTICS?

What is the name of the N.H.L. player that has scored his 500th goal and his 1 200th point in the 1975-76 season? He also scored his 100th point in the N.H.L. playoffs. To find the answer, find the following products. Write the letter of the questions above its correct answer in the code below.

(I) 85 x 44	(O) 58 x 51	(T) 30 x 37	(N) 36 x 48	(O) 39 x 32
(N) 68 x 56	(U) 58 x 15	(B) 88 x34	(S) 93 x 79	(B) 18 x 19
(R) 810 x 16	(H) 230 x 75	(S) 104 x 26	(Y) 573 x 70	(U) 944 x 45
(O) 524 x 600	(O) 432 x108	(F) 204 x 129	(N) 690 x331	(J) 786 x954

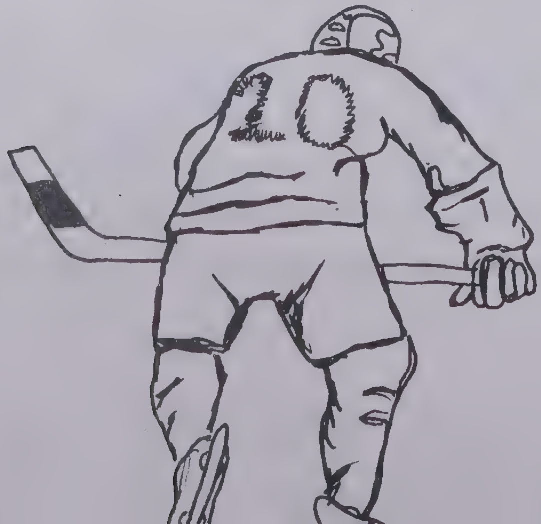
(K) 362 x 208 = n (C) 701 x 491 = n (B) 652 x 416 = n

749 844 314 400 17 250 228 390 | 271 232 42 480

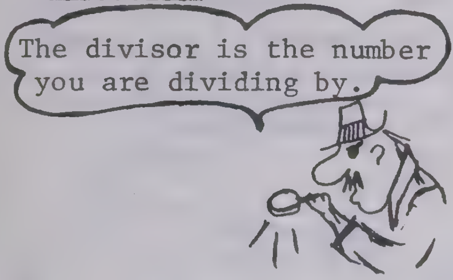
344 191 40 110 75 296 | 46 656 26 316 | 162 1 248

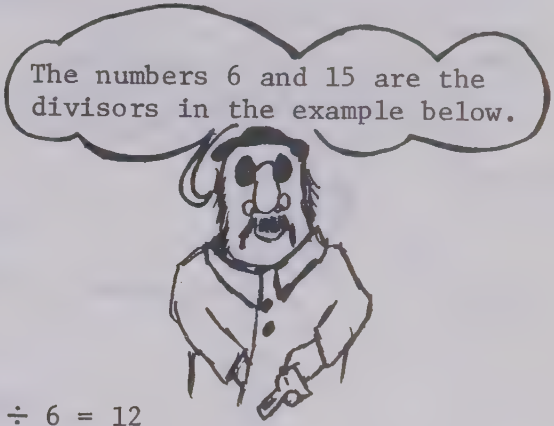
7 347 1 110 2 958 1 728 | 2 992 12 960

870 3 740 3 808 2 704 .



II Division


The divisor is the number you are dividing by.


The numbers 6 and 15 are the divisors in the example below.

Ex. 1

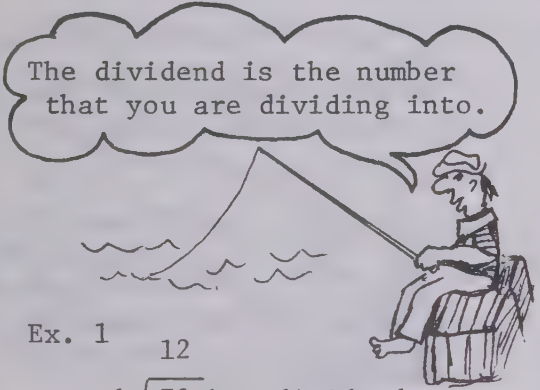
$$\begin{array}{r} 12 \\ \underset{\uparrow}{6}\,\overline{)\,72} \\ \text{divisor} \quad \underline{6} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

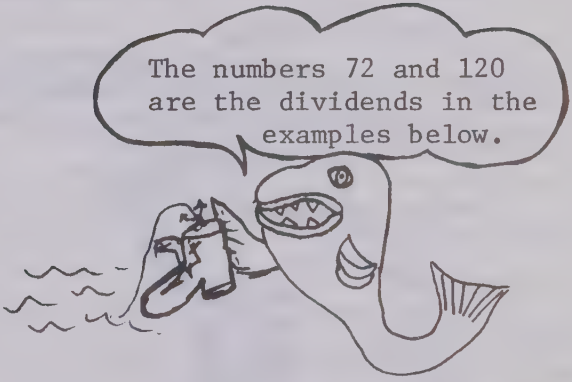
OR $72 \div \underset{\substack{\uparrow \\ \text{divisor}}}{6} = 12$

Ex. 2

$$\begin{array}{r} 8 \\ \underset{\uparrow}{15}\,\overline{)\,120} \\ \text{divisor} \quad \underline{120} \\ 0 \end{array}$$

OR $120 \div \underset{\substack{\uparrow \\ \text{Divisor}}}{15} = 8$


The dividend is the number that you are dividing into.


The numbers 72 and 120 are the dividends in the examples below.

Ex. 1

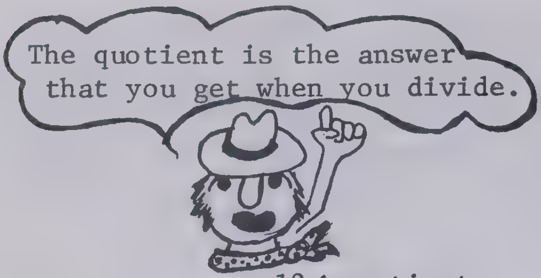
$$\begin{array}{r} 12 \\ 6\,\overline{)\,72} \leftarrow \text{dividend} \\ \underline{6} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

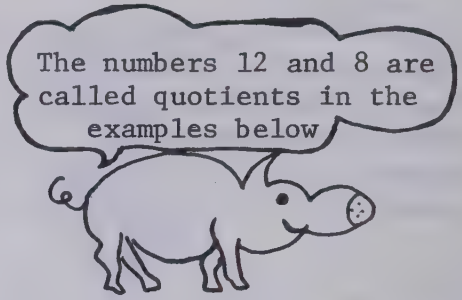
OR $\underset{\substack{\uparrow \\ \text{dividend}}}{72} \div 6 = 12$

Ex. 2

$$\begin{array}{r} 8 \\ 15\,\overline{)\,120} \leftarrow \text{dividend} \\ \underline{120} \\ 0 \end{array}$$

OR $\underset{\substack{\uparrow \\ \text{dividend}}}{120} \div 15 = 8$


The quotient is the answer that you get when you divide.


The numbers 12 and 8 are called quotients in the examples below

Ex. 1.

$$\begin{array}{r} 12 \leftarrow \text{quotient} \\ 6\,\overline{)\,72} \\ \underline{6} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

OR $72 \div 6 = 12 \leftarrow$ quotient

Ex. 2.

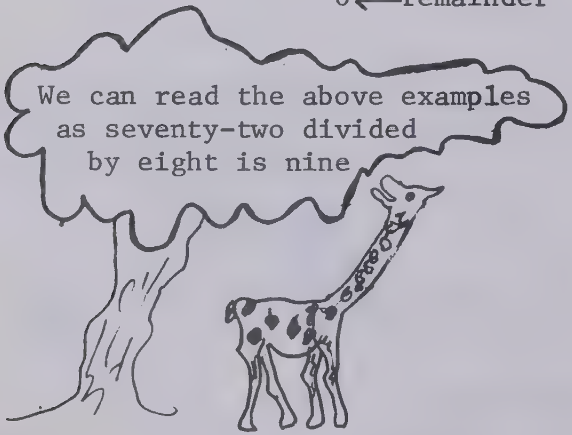
$$\begin{array}{r} 8 \leftarrow \text{quotient} \\ 15\,\overline{)\,120} \\ \underline{120} \\ 0 \end{array}$$

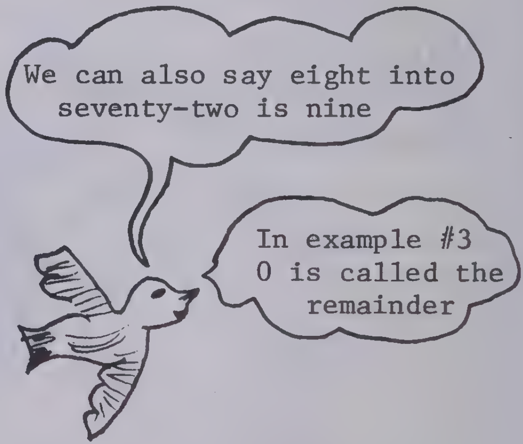
OR $120 \div 15 = 8 \leftarrow$ quotient

Ex. 3.

$$\begin{array}{r} 9 \leftarrow \text{quotient} \\ \text{divisor} \rightarrow 8\,\overline{)\,72} \leftarrow \text{dividend} \\ \underline{72} \\ 0 \leftarrow \text{remainder} \end{array}$$

OR $\underset{\text{dividend}}{\underset{\uparrow}{72}} \div \overset{\text{divisor}}{\overset{\swarrow}{8}} = 9 \leftarrow$ quotient


We can read the above examples as seventy-two divided by eight is nine


We can also say eight into seventy-two is nine
In example #3 0 is called the remainder

Note:

$$\begin{array}{r} \textit{quotient} \\ \textit{Divisor}\,\overline{)\,\textit{dividend}} \\ \\ \overline{\textit{remainder}} \end{array}$$

OR *dividend* ÷ *divisor* = *quotient*

Reminder

Any number divided by one is the number Ex. 1. $20 \div 1 = 20$

Ex. 2. $\begin{array}{r} 28 \\ 1\,\overline{)\,28} \end{array}$

Reminder

Zero divided by any number is zero. Ex. 1 $0 \div 17 = 0$

Ex. 2 $\begin{array}{r} 0 \\ 75\,\overline{)\,0} \end{array}$

Reminder

We cannot divide by zero. The divisor can never be zero. Ex. 1 $17 \div 0$ cannot divide

Ex. 2 $0\,\overline{)\,92}$ cannot divide

D. Determine which of the following numbers is the divisor, the dividend and the quotient.

1. 8 ← b)
a) 5 ⟌40 ← c)
↑ divisor

2. 7 ← b)
9 ⟌65 ← c) dividend
a) ↑

3. b)
56 ÷ 8 = 7
a) ↑ c) ↑ quotient

4. b)
84 ÷ 7 = 12
a) c)

5. 12 ← b)
15 ⟌180 ← c)
a) ↑

6. b)
306 ÷ 9 = 34
a) c)

WOUNDED FLOWER?

What is a certain wounded flower called? Find the quotient of each question below. Beside each question you will find a letter. Write the letter of the question above the correct answer of the question in the code below. Disregard the remainder, if there is any.

A. If the divisor is 7 and the dividend is 56, the quotient is ________

E. If the divisor is 6 and the dividend is 96, the quotient is ________

C. If the divisor is 9 and the dividend is 378, the quotient is ________

D. If the divisor is 5 and the dividend is 267, the quotient is ________

S. If the divisor is 8 and the dividend is 461, the quotient is ________

A. If the divisor is 4 and the dividend is 902, the quotient is ________

N. If the divisor is 10 and the dividend is 173, the quotient is ________

U. If the divisor is 12 and the dividend is 486, the quotient is ________

K. If the divisor is 15 and the dividend is 280, the quotient is ________

L. If the divisor is 34 and the dividend is 682, the quotient is ________

Y. If the divisor is 89 and the dividend is 2 601, the quotient is ________

A. If the divisor is 100 and the dividend is 5 600, the quotient is ________

E. If the divisor is 120 and the dividend is 7 040, the quotient is ________

B. If the divisor is 435 and the dividend is 16 750, the quotient is ________

S. If the divisor is 512 and the dividend is 9 728, the quotient is ________

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

8 38 20 225 42 18 58 29 16 53 19 40 57 56 17

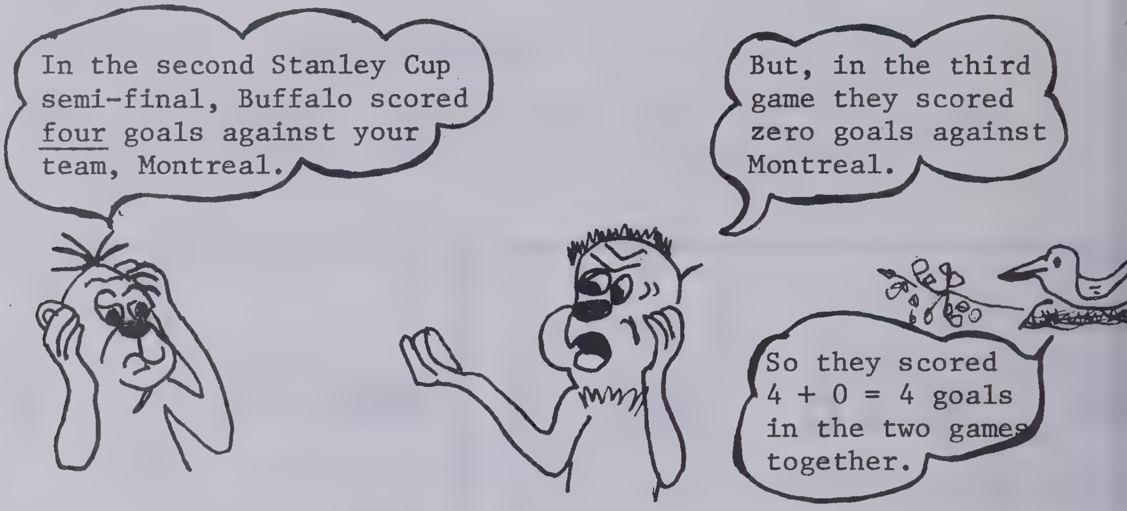
FIND THE BINGO

F. Find the quotient for each of the following. Then find the answer in the Bingo Chart and shade the region with the correct answer.

1. $3\overline{)51}$
2. $8\overline{)232}$
3. $9\overline{)603}$
4. $7\overline{)4\ 909}$
5. $25\overline{)625}$
6. $8\overline{)1\ 296}$
7. $7\overline{)349}$
8. $4\overline{)1\ 107}$
9. $64\overline{)8\ 000}$
10. $88\overline{)1\ 936}$
11. $90\overline{)2\ 460}$
12. $19\overline{)7\ 902}$
13. $250\overline{)17\ 750}$
14. $143\overline{)7\ 256}$
15. $1\ 280 \div 8 = n$
16. $9\ 753 \div 11 = n$
17. $2\ 258 \div 24 = n$
18. $5\ 355 \div 402 = n$
19. $46\ 349 \div 88 = n$
20. $17\ 364 \div 855 = n$

9	49 r 6	701 r 2	886 r 7	67
0 r 2	125	526 r 59	415 r 17	94 r 2
9	50 r 106	260	162	276 r 3
129	25	27 r 30	39	160
2	215 r 73	17	71	20 r 264

A.


In the second Stanley Cup semi-final, Buffalo scored four goals against your team, Montreal.
But, in the third game they scored zero goals against Montreal.
So they scored 4 + 0 = 4 goals in the two games together.

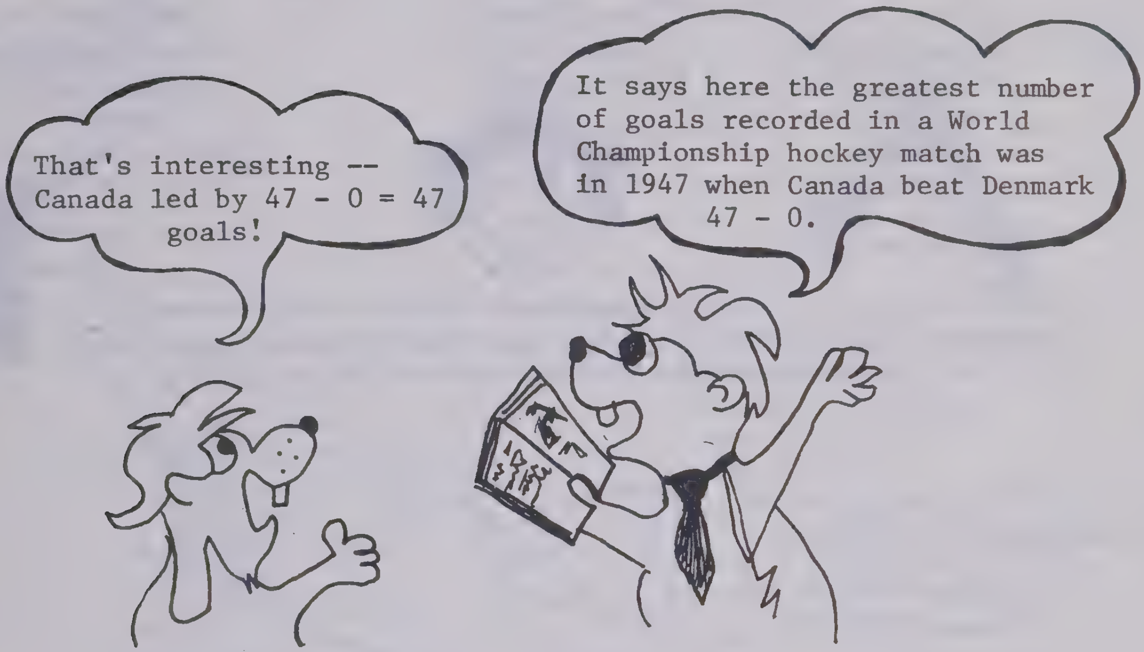
REMEMBER, Adding zero to any number leaves the number unchanged!

e.g. $0 + 11 = 11$
$5 + 0 = 5$
$21 + 0 = 21$

Exercises: Add:

1. $6 + 0 =$ ________
2. $0 + 9 =$ ________
3. $5 + 0 =$ ________
4. $8 + 0 =$ ________
5. $0 + 19 =$ ________
6. $28 + 0 =$ ________
7. $89 + 0 =$ ________
8. $0 + 101 =$ ________
9. $240 + 0 =$ ________
10. $0 + 115 =$ ________

B.


That's interesting -- Canada led by 47 - 0 = 47 goals!
It says here the greatest number of goals recorded in a World Championship hockey match was in 1947 when Canada beat Denmark 47 - 0.

REMEMBER, Subtracting zero from any number leaves it unchanged.

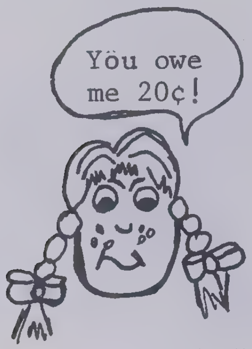
e.g. 8 - 0 = 8
20 - 0 = 20

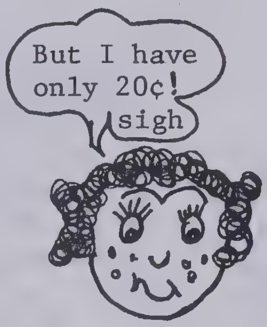
Exercises:

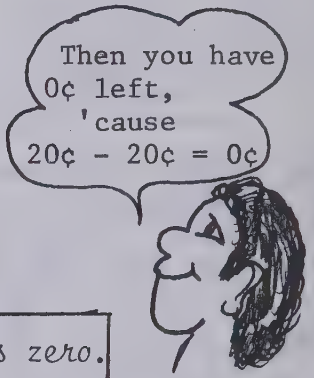
Subtract:

1. 18 - 0 = ________
2. 21 - 0 = ________
3. 39 - 0 = ________
4. 1 - 0 = ________
5. 0 - 0 = ________
6. 44 - 0 = ________
7. 205 - 0 = ________
8. 1 041 - 0 = ________
9. 78 - 0 = ________
10. 54 - 0 = ________

C.


You owe me 20¢!


But I have only 20¢! sigh


Then you have 0¢ left, 'cause 20¢ - 20¢ = 0¢

REMEMBER, Subtracting a number from itself leaves zero.

e.g. 15 - 15 = 0
1 - 1 = 0
0 - 0 = 0

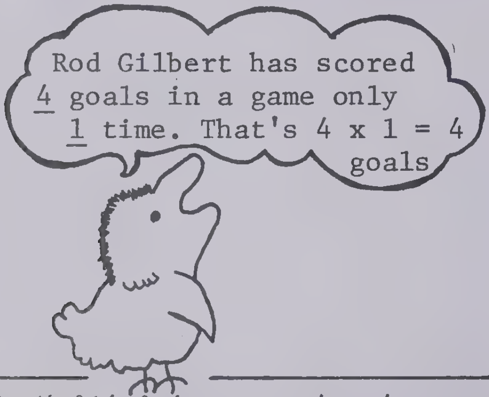
Exercises: Subtract:

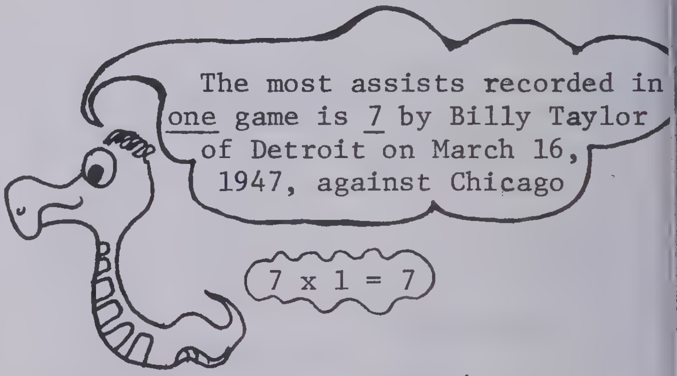
1. 7 - 7 = ______ 2. 18 - 18 = ______ 3. 5 - 5 = ______

4. 16 - 16 = ______ 5. 20 - 20 = ______ 6. 45 - 45 = ______

7. 104 - 104 = ______ 8. 555 - 555 = ______ 9. 1 - 1 = ___ 10. 36 - 36 =

D.


Rod Gilbert has scored 4 goals in a game only 1 time. That's 4 x 1 = 4 goals


The most assists recorded in one game is 7 by Billy Taylor of Detroit on March 16, 1947, against Chicago
7 x 1 = 7

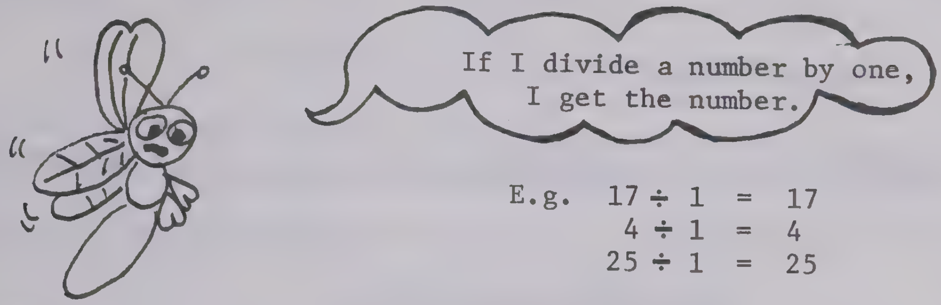
REMEMBER, Multiplying a number by one leaves the number unchanged!

e.g. 4 x 1 = 4
1 x 12 = 12

Exercises:

1. 6 x 1 = ______
2. 1 x 5 = ______
3. 24 x 1 = ______
4. 1 x 13 = ______
5. 18 x 1 = ______
6. 404 x 1 = ______
7. 44 x 1 = ______
8. 115 x 1 = ______
9. 1 x 75 = ______
10. 1 x 22 = ______

E.


If I divide a number by one, I get the number.

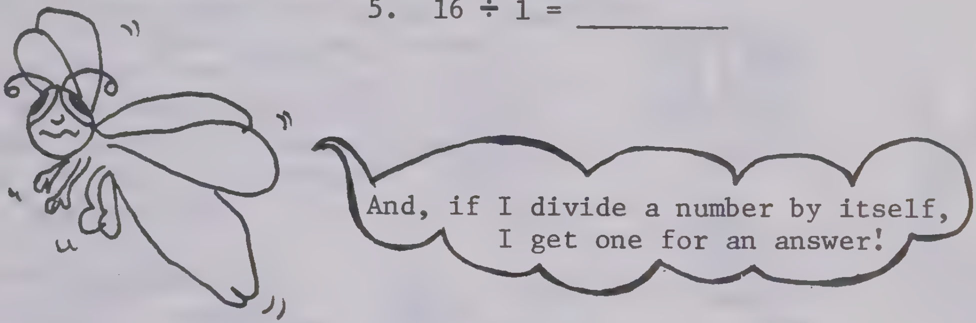
E.g. 17 ÷ 1 = 17
4 ÷ 1 = 4
25 ÷ 1 = 25

Exercises:

1. 41 ÷ 1 = ________
2. 26 ÷ 1 = ________

3. 7 ÷ 1 = ________
4. 180 ÷ 1 = ________
5. 16 ÷ 1 = ________

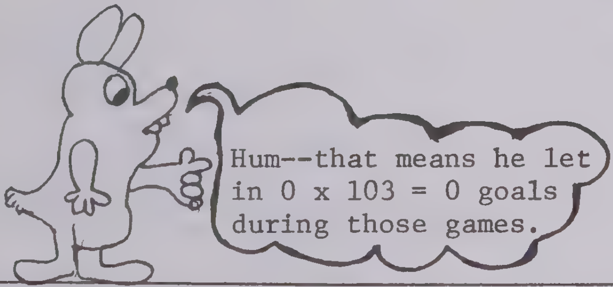
F.

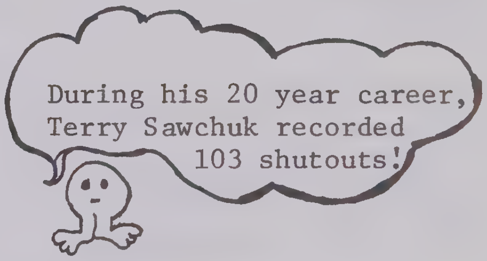

And, if I divide a number by itself, I get one for an answer!

1. 7 ÷ 7 = ________
2. 44 ÷ 44 = ________

3. 125 ÷ 125 = ________
4. 9 ÷ 9 = ________
5. 1 ÷ 1 = ________

G.


Hum--that means he let in 0 x 103 = 0 goals during those games.


During his 20 year career, Terry Sawchuk recorded 103 shutouts!

REMEMBER, If you multiply a number by zero, you always get zero for an answer.

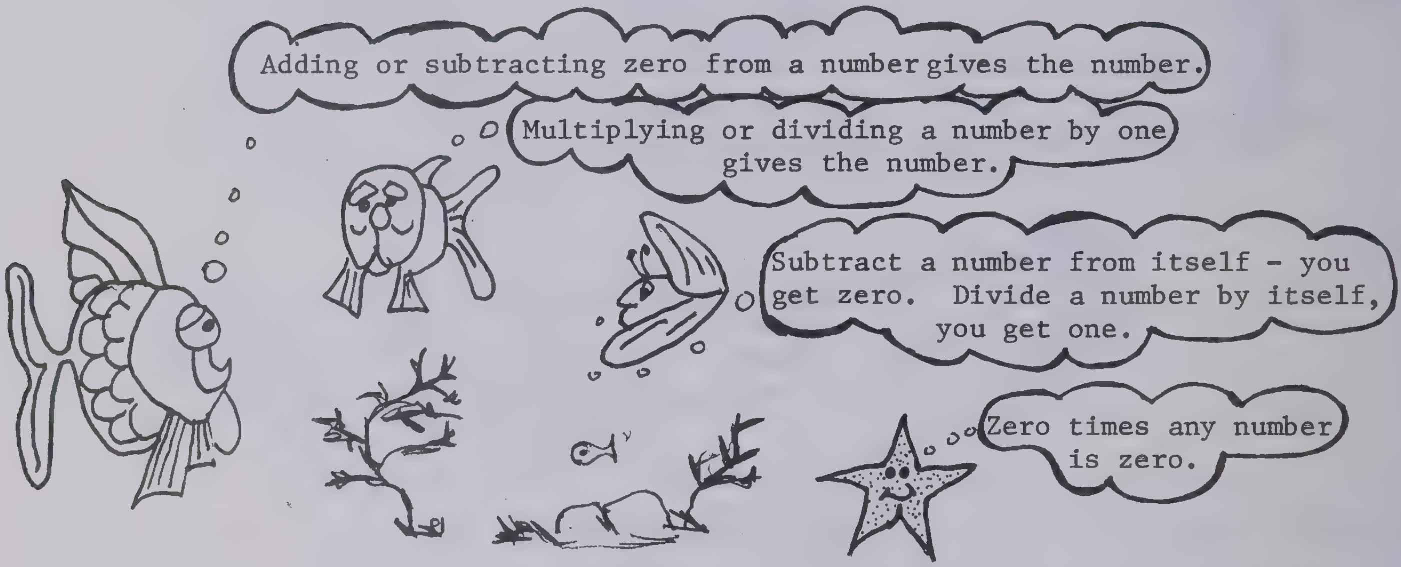
Eg. 0 x 6 = 0
71 x 0 = 0
541 x 0 = 0

Exercises:

1. 9 x 0 = ________
2. 0 x 26 = ________
3. 100 x 0 = ________
4. 75 x 0 = ________
5. 258 x 0 = ________

6. 0 x 899 = ________
7. 34 x 0 = ________
8. 189 x 0 = ________
9. 4 x 0 = ________
10. 0 x 19 = ________

H. REMEMBER ALL THE RULES:


Adding or subtracting zero from a number gives the number.
Multiplying or dividing a number by one gives the number.
Subtract a number from itself - you get zero. Divide a number by itself, you get one.
Zero times any number is zero.

EXERCISES:

1. 5 - 5 = ________
2. 24 + 0 = ________
3. 16 x 1 = ________
4. 44 ÷ 44 = ________
5. 28 - 0 = ________
6. 45 ÷ 1 = ________
7. 0 x 5 = ________
8. 10 x 1 = ________
9. 64 + 0 = ________
10. 29 x 1 = ________

WHAT IS THE DIFFERENCE BETWEEN DYING AND FAINTING?

The answer to this riddle is written in code at the bottom of the page. To break the code, work any problem and find the answer in the code.

Each time the answer appears in the code, you must write the letter of the problem above it.

A. 7 + 0 = ________

B. 9 x 1 = ________

C. 0 + 4 = ________

E. 18 ÷ 18 = ________

H. 45 - 0 = ________

I. 1 x 29 = ________

K. 14 - 14 = ________

L. 99 x 1 = ________

N. 0 + 10 = ________

O. 51 x 1 = ________

P. 64 ÷ 1 = ________

R. 67 - 0 = ________

T. 1 x 105 = ________

U. 46 + 0 = ________

Y. 85 x 1 = ________

When you die:

___ ___ ___   ___ ___ ___ ___   ___ ___ ___   ___ ___ ___ ___ ___ ___
85 51 46   0 29 4 0   105 45 1   9 46 4 0 1 105

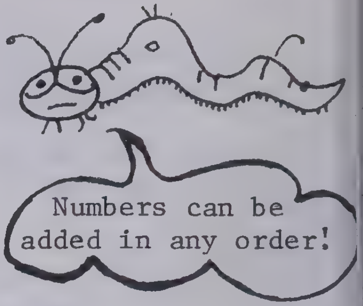
When you faint:

___ ___ ___   ___ ___ ___ ___   ___   ___ ___ ___ ___ ___ ___   ___ ___ ___ ___
85 51 46   105 46 67 10   7   99 29 105 105 99 1   64 7 99 1

EXERCISES: UNIT II OBJECTIVE NO. 10

I. Expressions without parentheses:

A. Number sentences involving only addition:


Numbers can be added in any order!

eg. $\underline{6 + 3} + 7 = 9 + 7 = 16$

or $6 + \underline{3 + 7} = 6 + 10 = 16$

or $\underline{6} + 3 + \underline{7} = 13 + 3 = 16$

Exercises:

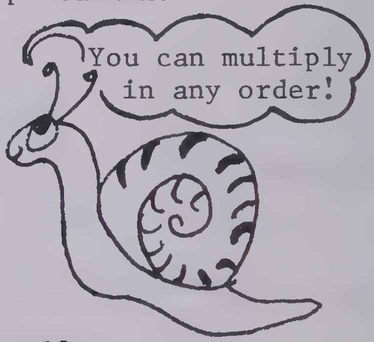
1. 3 + 4 + 9 = __________
2. 3 + 7 + 15 = __________
3. 10 + 8 + 2 = __________
4. 7 + 5 + 8 = __________
5. 13 + 22 + 17 = __________
6. 28 + 16 + 9 = __________
7. 33 + 45 + 17 = __________
8. 25 + 13 + 55 = __________
9. 39 + 42 + 86 = __________
10. 97 + 2 + 68 = __________

B. Number sentences involving only multiplication:

eg. $\underline{4 \times 2} \times 5 = 8 \times 5 = 40$

or $4 \times \underline{2 \times 5} = 4 \times 10 = 40$

or $\underline{4} \times 2 \times \underline{5} = 20 \times 2 = 40$

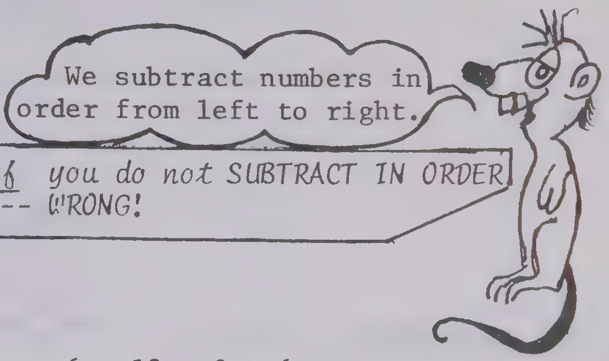

You can multiply in any order!

Exercises:

1. 3 x 5 x 6 = __________
2. 2 x 3 x 4 = __________
3. 10 x 2 x 5 = __________
4. 2 x 7 x 5 = __________
5. 4 x 3 x 7 = __________
6. 8 x 7 x 10 = __________
7. 11 x 3 x 5 = __________
8. 12 x 9 x 10 = __________
9. 14 x 5 x 20 = __________
10. 23 x 10 x 12 = __________

C. Number sentences involving only subtraction:

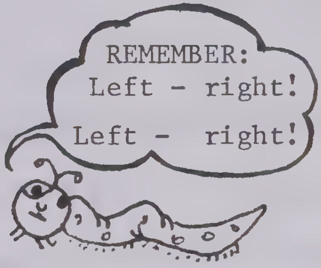
eg. 8 - 3 - 1 = 5 - 1 = 4


We subtract numbers in order from left to right.

*NOTE: Incorrect answers will result *if* you do not SUBTRACT IN ORDER*
e.g. 8 - 3 - 1 = 8 - 2 = 6 --- WRONG!

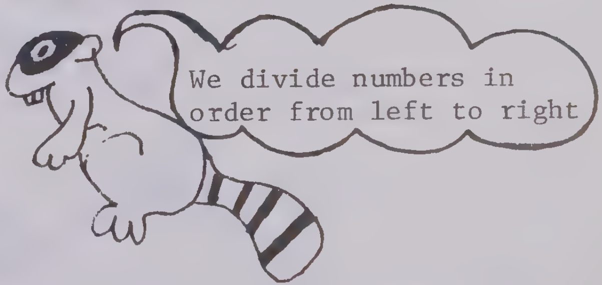
Exercises: Subtract in order:

1. 6 - 2 - 3 = ________
2. 9 - 4 - 2 = ________
3. 25 - 10 - 7 = ________
4. 13 - 4 - 7 = ________
5. 38 - 16 - 15 = ________
6. 19 - 3 - 6 = ________
7. 26 - 11 - 7 = ________
8. 45 - 21 - 14 = ________
9. 58 - 16 - 23 = ________
10. 41 - 19 - 10 = ________


REMEMBER:
Left - right!
Left - right!

D. Number sentences involving only division:

eg. 24 ÷ 3 ÷ 2 = 8 ÷ 2 = 4


We divide numbers in order from left to right

NOTE AGAIN! DIVIDE IN ORDER!

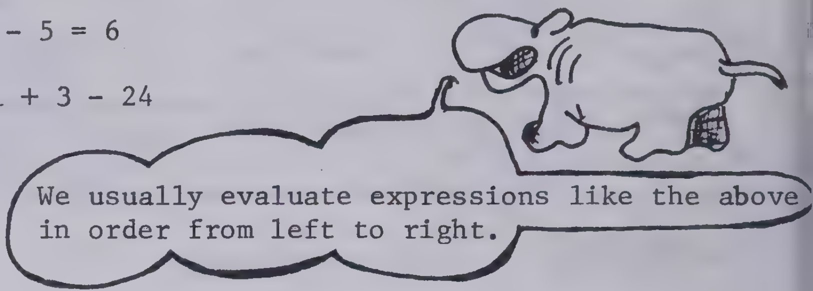
Exercises:

1. 40 ÷ 5 ÷ 2 = ________
2. 18 ÷ 2 ÷ 9 = ________
3. 20 ÷ 2 ÷ 2 = ________
4. 20 ÷ 5 ÷ 4 = ________
5. 64 ÷ 2 ÷ 8 = ________
6. 52 ÷ 2 ÷ 13 = ________
7. 72 ÷ 4 ÷ 6 = ________
8. 85 ÷ 5 ÷ 1 = ________
9. 96 ÷ 3 ÷ 4 = ________
10. 120 ÷ 10 ÷ 4 = ________

E. Expressions which involve addition and subtraction combined.

e.g. $\underline{7 + 4} - 5 = 11 - 5 = 6$

$\underline{26 - 5} + 3 = 21 + 3 - 24$


We usually evaluate expressions like the above in order from left to right.

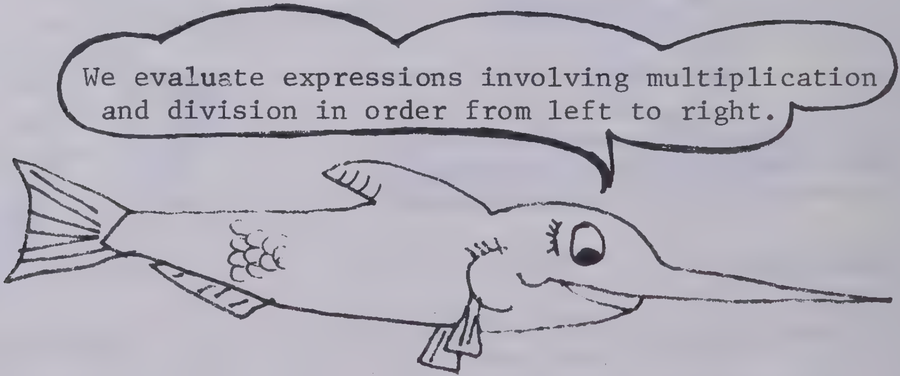
Exercises:

1. 3 + 8 - 5 = ________
2. 9 - 3 + 6 = ________
3. 10 + 4 - 3 = ________
4. 16 - 6 + 5 = ________
5. 19 + 3 - 6 = ________
6. 25 + 3 - 8 = ________
7. 7 + 11 - 12 = ________
8. 17 - 5 + 8 = ________
9. 32 - 12 + 7 - 10 = ________
10. 26 + 11 - 14 - 5 = ________

F. Expressions which involve multiplication and division combined.

e.g. $\underline{3 \times 15} \div 5 = 45 \div 5 = 9$

$32 \div 8 \times 3 = 4 \times 3 = 12$


We evaluate expressions involving multiplication and division in order from left to right.

Exercises:

1. 2 x 7 ÷ 2 = ________
2. 16 ÷ 4 x 3 = ________
3. 20 ÷ 2 x 6 = ________
4. 9 x 8 ÷ 2 = ________
5. 12 x 5 ÷ 15 = ________
6. 8 x 5 ÷ 10 = ________
7. 96 ÷ 32 x 29 = ________
8. 12 x 4 ÷ 16 = ________
9. 8 x 12 ÷ 3 = ________
10. 28 ÷ 4 x 12 ÷ 6 = ________

G. Expressions which involve mixed operations:

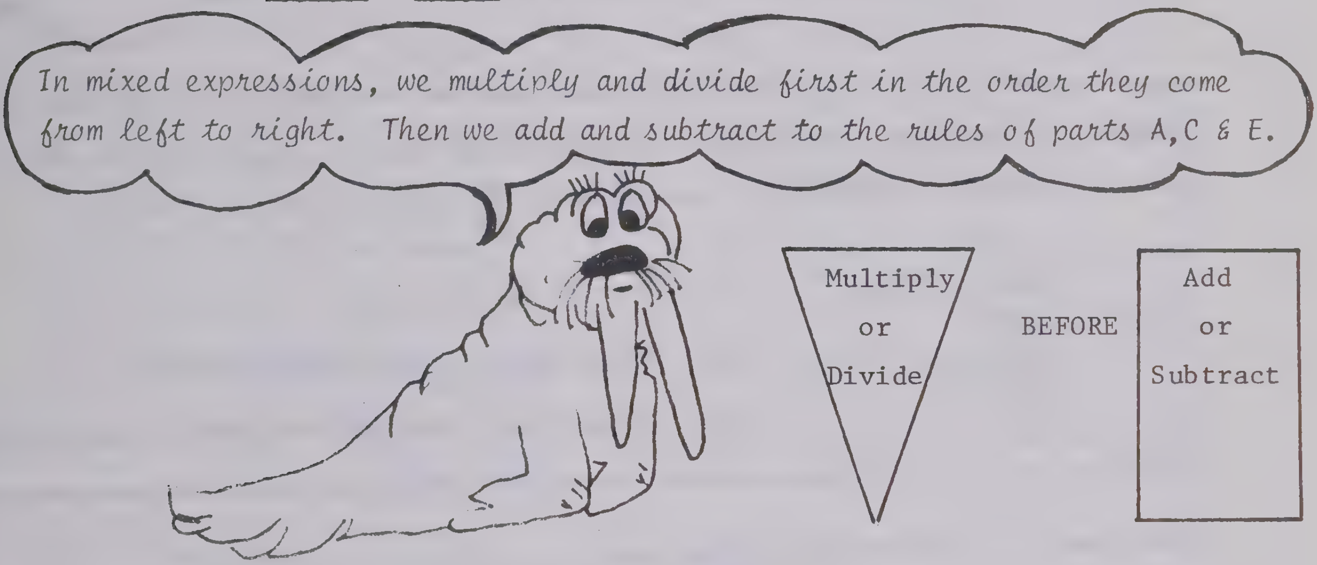
e.g. $\underline{5 \times 6} - 12 = 30 - 12 = 18$

$28 + \underline{7 \times 3} = 28 + 21 = 49$

$35 - \underline{40 \div 8} = 35 - 5 = 30$

$6 + \underline{2 \times 8} - 3 = \underline{6 + 16} - 3 = 22 - 3 = 19$

$\underline{27 \div 3} - \underline{2 \times 3} = 9 - 6 = 3$


In mixed expressions, we multiply and divide first in the order they come from left to right. Then we add and subtract to the rules of parts A,C & E.
Multiply or Divide
BEFORE
Add or Subtract

Exercises:

1. $3 \times 9 + 11 =$ ____________

2. $5 \times 7 - 15 =$ ____________

3. $24 \div 6 + 10 =$ ____________

4. $4 + 8 \times 5 =$ ____________

5. $17 - 66 \div 11 =$ ____________

6. $98 - 12 \times 6 =$ ____________

7. $32 \div 4 - 2 \times 4 =$ ____________

8. $24 - 3 \times 5 \div 3 =$ ____________

9. $21 - 8 + 5 \times 9 =$ ____________

10. $7 \times 9 - 81 \div 3 =$ ____________

11. $5 + 27 \div 9 \times 3 =$ ____________

12. $100 - 10 \times 7 \div 35 =$ ____________

II. Expressions with parentheses:

e.g. $7 - (3 + 2) = 7 - 5 = 2$

$(14 + 2) \times 5 = 16 \times 5 = 80$

$(40 - 8) \div 4 \times 3 = \underline{32 \div 4} \times 3 = 8 \times 3 = 24$

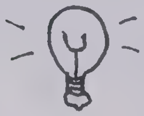
$(11 + 4) \div (1 \times 5) = 15 \div 5 = 3$

ORDER:

1. *Parentheses*
2. *Multiply or divid*
3. *Add or subtract*

NOTE: We evaluate expressions in parentheses first, then evaluate the remaining expression according to the rules given in Part I.

MEMORY HELPER: *P. M. D. A. S.*



---> "Perry makes donuts after school"

---> Parentheses, Multiply or Divide, Add or Subtrac

Exercises: Evaluate the following:

1. $25 \div (4 + 1) =$ ____________
2. $(6 + 4) \div (35 \div 7) =$ ____________
3. $(12 - 7) \times 8 =$ ____________
4. $4 \times (9 + 14) =$ ____________
5. $(30 - 18) \times 6 =$ ____________
6. $67 + (5 - 2) \times 4 =$ ____________
7. $(29 - 5) \div 6 =$ ____________
8. $(41 + 7) \div 12 =$ ____________
9. $20 \times (19 - 13) =$ ____________
10. $(34 - 24) \times 47 =$ ____________
11. $(5 \times 2 + 14) \div 3 =$ ____________
12. $18 - (6 \times 2 + 6) =$ ____________
13. $50 \div (10 + 15) =$ ____________
14. $(69 - 4) \div 13 + 8 =$ ____________
15. $(9 \times 2) - 18 =$ ____________
16. $(58 + 7) \div 5 =$ ____________
17. $63 \div (38 - 31) =$ ____________
18. $15 \times (54 \div 9) =$ ____________
19. $60 \div (5 \times 6) =$ ____________
20. $(23 - 17) + (18 \times 5) =$ ____________

EXERCISES: Review UNIT II OBJECTIVE NO. 10

III. Directions:

The answer to this riddle is written in code at the bottom of the page. To break the code, work any problem and find the answer in the code. Each time the answer appears in the code, you must write the letter of the problem above it.

M. (26 - 8) ÷ 2 = ________

K. 38 ÷ (31 - 12) = ________

Y. 13 + 6 x 9 - 4 = ________

A. 53 + 5 x 6 = ________

H. (47 - 11) x 3 = ________

L. 4 + (6 x 8) + 2 = ________

E. 2 x 7 - (12 ÷ 3) = ________

S. 3 x (19 - 2) = ________

C. 89 - (6 x 6) = - ________

O. (3 x 5) + (35 ÷ 7) = ________

I. 5 x (15 + 12) = ________

T. 8 x (7 - 4) x 7 = ________

N. (24 + 60) ÷ 4 = ________

G. 48 + 5 x 11 - 13 = ________

What did the monkey say to the elephant?

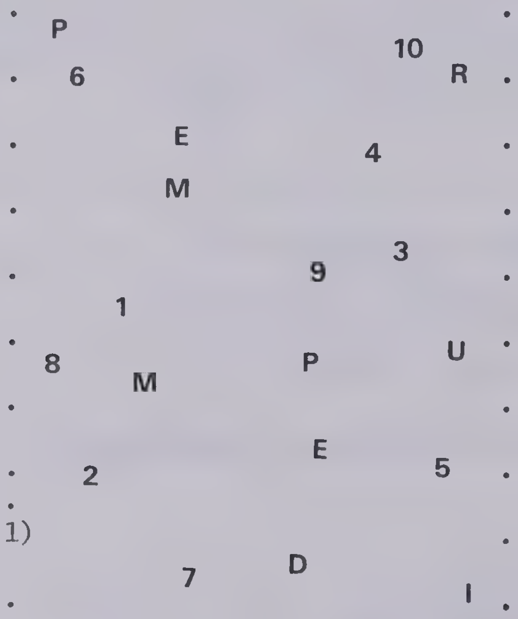
21 20 168 108 135 21 90   9 20 21 2 10 63 51

53 83 21 168   168 83 54 2

PUMPERNICKEL DURING INFLATION

Compare the following pairs of expressions. The first one contains parentheses, the second does not. Find the answer to each expression. Then draw a straight line matching the question to the correct answer. The line will pass through a number and a letter. You are to place the letter in the numbered box below, and you will find the word to complete the sentence below.

1.a.	(19 - 6) x 3	6
b.	19 - 6 x 3	1
2.a.	48 ÷ (6 - 2)	126
b.	48 ÷ 6 - 2	39
3.a.	(7 + 9) x 5	12
b.	7 + 9 x 5	57
4.a.	8 x (15 + 6)	80
b.	8 x 15 + 6	168
5.a.	(30 - 11) x (2 + 1)	9
b.	30 - 11 x 2 + 1	52



If inflation goes any further, pretty soon pumpernickel will be:

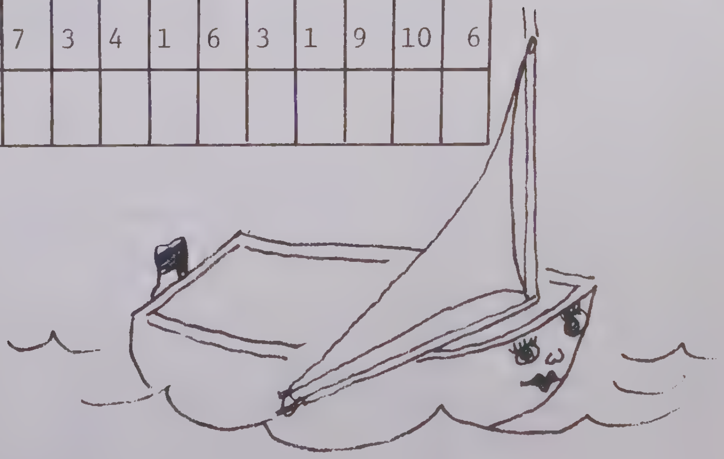
1	2	3	4	5	6	7	8	9	10

TO FIND OUT WHEN A BOAT IS AFFECTIONATE?

DO THIS: Each product and quotient in Column A has an equivalent expression in Column B. Match any expression in Column A with its equivalent in Column B. The number in front of the answer tells you where to put the letter of the question into the row of boxes at the bottom.

COLUMN A		COLUMN B	
e.	$6(8)$	1.	$\frac{y}{5}$
g.	$7\overline{)14}$	2.	$4x$
h.	$y \div 5$	3.	9×8
i.	10×100	4.	$20 \div 5$
n.	$x(4)$	5.	$7\overline{)35}$
o.	$\frac{12}{6}$	6.	6×8
r.	$8x$	7.	$14 \div 7$
s.	$9(8)$	8.	$10(100)$
t.	$5\overline{)20}$	9.	$6\overline{)12}$
u.	$28 \div 4$	10.	$8(x)$
w.	$\frac{35}{7}$	11.	$\frac{28}{4}$

5	1	6	2	8	4	1	11	7	3	4	1	6	3	1	9	10	6



CONCENTRATION: Any number may play.

All the cards are dealt out face down on the table so that they are not touching. The first player picks two cards, one at a time, turning them over for all to see. If they match (are equivalent), he puts them face down beside him, out of play, and picks another two. If they don't match, he puts them back, face down on the table. The next player plays, but trying to remember what cards have been turned before so he can pick matching pairs. The winner is the one who gets the most cards.

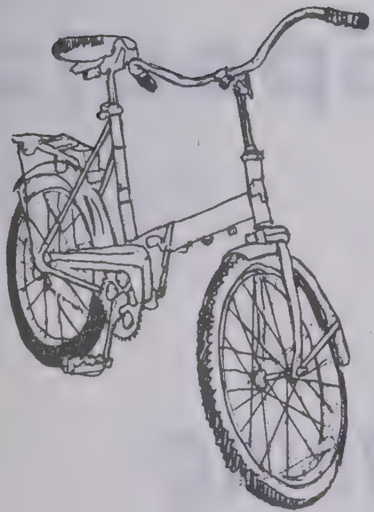
Sample of cards that could be made up for a game of concentration to drill on multa table and on the different ways of writing "multiply" and "divide".

2 x 5	10	3(6)	18	4 x 6	24	5(6)	30
6 x 6	36	6(7)	42	6x8	6(9)	48	54
3 x 7	21	$\frac{28}{7}$	4	$5\overline{)35}$	7	$7\overline{)42}$	6
$9\overline{)81}$	9	$\frac{72}{9}$	8	56 ÷ 7	8	64	8(8)
7(7)	49	7x8	56	$\frac{40}{8}$	5	$9\overline{)27}$	3

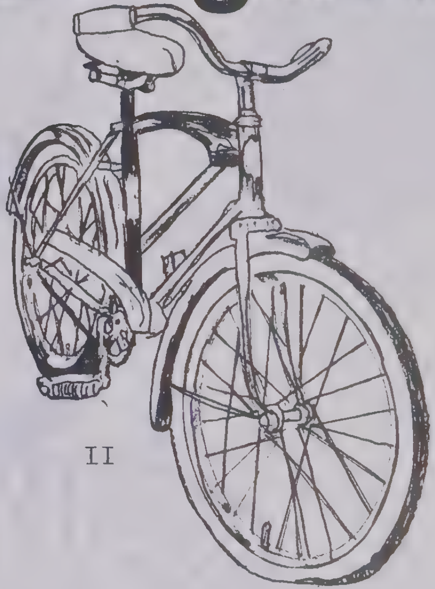
Complete the table at the bottom of the page using the two ads below.

Special Purchase

Big Bargain



I $70.



II $60.

If "n" stands for the price of one bicycle, evaluate the following expressions, first for store I and then for store II.

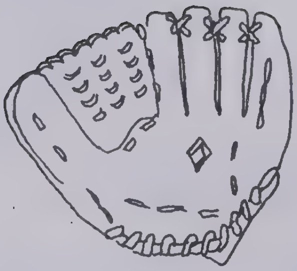
SITUATION	EXPRESSION	STORE I	STORE II
You and your friend go to the same store and both buy a bicycle.	n + n	n + n = 70 + 70 = $140.	n + n 60 + 60 = $120.
You go to the store and buy two bicycles.	2n		
You go to the store and buy a bicycle plus a speedometer for $5.	n + 5		
You go to the store and the clerk gives you a $5 discount on a bicycle that you have decided to buy.	n - 5		
You and a friend go to the store to buy a bicycle. You buy one bicycle and split the cost with your friend.	n ÷ 2		

EXERCISES: (B) UNIT II OBJECTIVE NO. 12

Store I

$10.

Weekend Special



Spring Sale

Store II

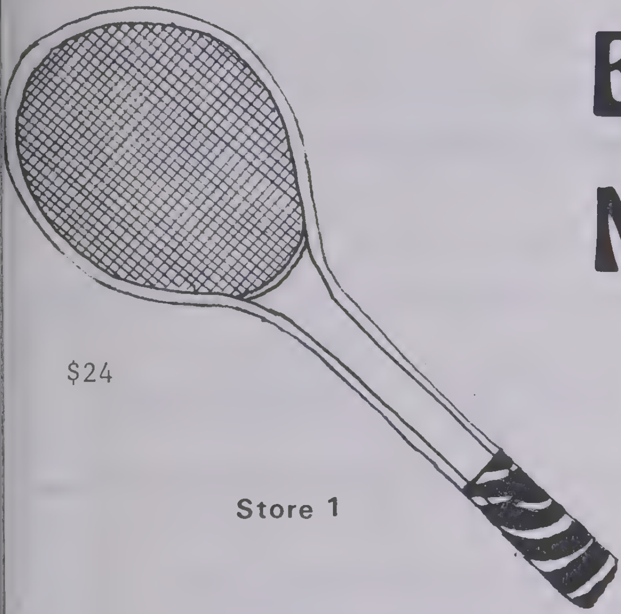
$15.

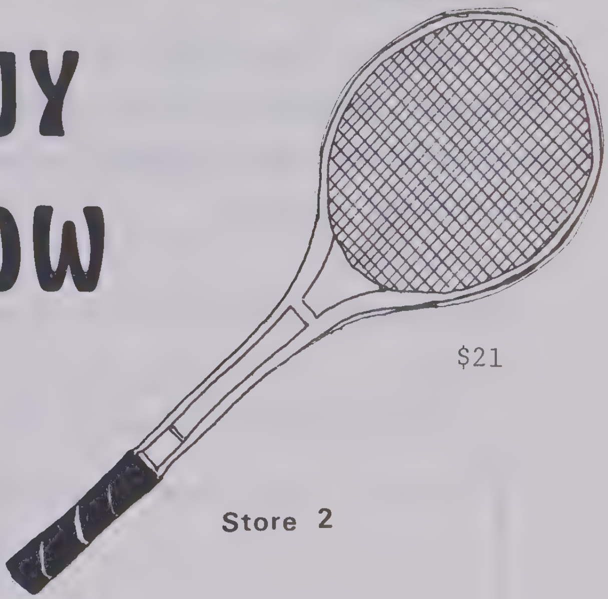
If "n" stands for the price of one baseball glove, evaluate the following expressions, first for Store I, then for Store II.

EXPRESSION	STORE I	STORE II
1. $n + n$		
2. $2n$		
3. $n + 3$		
4. $n - 2$		
5. $n \div 5$		

PRICES are LOW!

BUY NOW





If "n" stands for the price of one tennis racket, evaluate the following expressions, first for Store I and then for Store II:

EXPRESSION	STORE I	STORE II
1. n + n		
2. 4n		
3. n + 10		
4. n - 8		
5. n ÷ 3		

A QUACKY PROBLEM

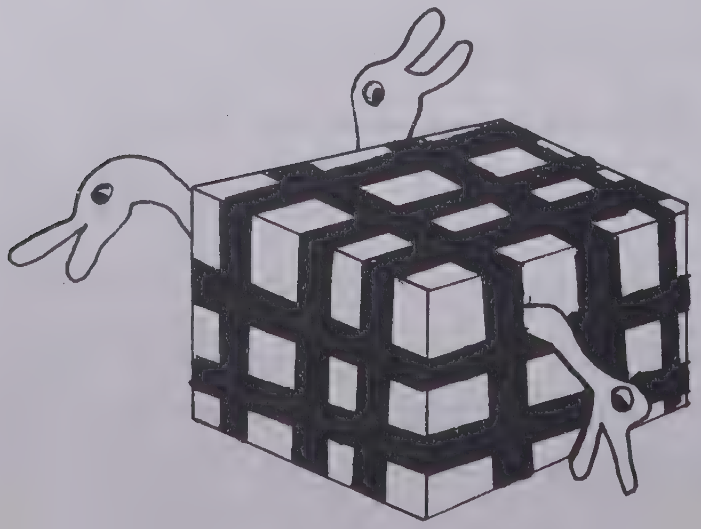
What do you have when you put three ducks in a crate?

Directions:

The answer to this riddle is written in code at the bottom of the page. To break the code, work any problem and find the answer in the code. Each time the answer appears in the code, you must write the letter of the problem above it.

A 2x = ____ if x is 7	B x ÷ 3 = ____ if x is 12	C n + n = ____ if n is 20	E n - 8 = ____ if n is 18
F 15 - n = ____ if n is 14	O n x 5 = ____ if n is 10	Q n + n + n= ____ if n is 3	R 25 ÷ x = ____ if x is 5
S x - 20 = ____ if x is 49	U 10x = ____ if x is 10	K n ÷ 10 = ____ if n is 80	X 4x = ____ if x is 8

14   4 50 32   50 1   9 100 14 40 8 10 5 29



A. Solving Equations

Solving equations of the form $x + A = B$

e.g. $x + 7 = 17$ $\quad$ $y + 2 = 18$

$x = 10$ $\quad$ $y = 16$

Since $10 + 7 = 17$ $\quad$ Since $16 + 2 = 18$

1. Exercises: Find the unknown in the following:

a. $x + 12 = 19$ ____________

b. $a + 30 = 60$ ____________

c. $y + 20 = 42$ ____________

d. $d + 25 = 75$ ____________

e. $n + 16 = 24$ ____________

f. $x + 32 = 89$ ____________

g. $k + 42 = 128$ ____________

h. $n + 67 = 328$ ____________

i. $n + 91 = 238$ ____________

j. $x + 98 = 399$ ____________

B. Solving equations of the form $x - A = B$

e.g. $x - 13 = 15$ $\quad$ $n - 14 = 68$

$x = 28$ $\quad$ $n = 82$

Since $\underline{28} - 13 = 15$ $\quad$ Since $\underline{82} - 14 = 68$

2. Exercises: Find the unknown in the following:

a. $x - 12 = 26$ ____________

b. $a - 9 = 30$ ____________

c. $b - 24 = 52$ ____________

d. $y - 5 = 74$ ____________

e. $c - 1 = 92$ ____________

f. $k - 6 = 63$ ____________

g. $d - 61 = 61$ ____________

h. $x - 120 = 38$ ____________

i. $n - 47 = 53$ ____________

j. $x - 109 = 58$ ____________

C. Solving equalities of the form $Ax = B$

e.g. $4x = 16$ $13x = 65$

$x = 4$ $x = 5$

Since $4 \times 4 = 16$ Since $13 \times 5 = 65$

3. Exercises: Find the unknown in the following:

a. $9x = 63$ ________

b. $20y = 120$ ______

c. $2a = 58$ ______

d. $9n = 72$ ________

e. $12x = 144$ ________

f. $25y = 250$ _______

g. $19b = 570$ _________

h. $15x = 180$ ________

i. $23y = 253$ _________

j. $242n = 1\,452$ ________

D. Solving equalities of the form $\frac{x}{A} = B$

e.g. $\frac{x}{6} = 7$ $\frac{x}{12} = 5$

$x = 42$ $x = 60$

Since $\frac{42}{6} = 7$ Since $\frac{60}{12} = 15$

4. Exercises: Find the unknown in the following:

a. $\frac{x}{8} = 6$ _________

b. $\frac{a}{9} = 10$ ________

c. $\frac{x}{10} = 18$ _________

d. $\frac{y}{4} = 22$ _________

e. $\frac{n}{7} = 13$ _________

f. $\frac{b}{16} = 8$ _________

g. $\frac{n}{17} = 4$ _________

h. $\frac{x}{12} = 20$ ___________

i. $\frac{d}{19} = 19$ ___________

j. $\frac{k}{40} = 15$ ____________

E. Review Exercises:

Question: Why are Saturday and Sunday strong days?

To find the answer to this interesting question, follow these directions:

The answer to this riddle is written in code at the bottom of the page. To break the code, work any problem and find the answer in the code. Each time the answer appears in the code you must write the letter of the problem above it.

A : $x + 21 = 40$

H : $x - 8 = 24$

E : $6d = 66$

S : $\frac{x}{18} = 2$

Y : $y + 13 = 44$

B : $a - 90 = 145$

H : $\frac{k}{7} = 12$

E : $t + 120 = 242$

U : $11b = 99$

K : $14x = 140$

E : $\frac{y}{5} = 17$

D : $c - 37 = 38$

S : $x - 54 = 34$

R : $8x = 96$

T : $n + 79 = 124$

E : $x + 67 = 128$

C : $y - 16 = 54$

O : $\frac{a}{8} = 12$

E : $13c = 52$

W : $\frac{x}{3} = 14$

E : $x + 74 = 185$

R : $14k = 70$

A : $\frac{x}{31} = 20$

T : $y + 128 = 259$

E : $a - 119 = 331$

S : $125x = 2\ 125$

A : $n - 241 = 109$

235 85 70 19 9 36 111   131 32 61

96 45 84 450 5 88   350 12 122   42 11 4 10

75 620 31 17

To verify (check) if your answer for a condition is correct use the BSC plan.

B means you put brackets around the variable.

S means substitute your answer for the variable (inside the brackets)

C means you calculate the value of the expression

Variable is a placeholder- usually a letter.

☺ If the "C" sentence is true, then your answer must be correct.

Look at the examples below.

	Condition	Verification
Example 1.	$x + 3 = 7$	B: $(x) + 3 = 7$
	$x = 4$	S: $(4) + 3 = 7$
		C: $7 = 7$ ☺
Example 2.	$2x = 16$	B: $2(x) = 16$
	$x = 8$	S: $2(8) = 16$
		C: $16 = 16$ ☺
Example 3:	$x + 5 = 11$	B: $(x) + 5 = 11$
	$x = 7$	S: $(7) + 5 = 11$
		C: $12 \neq 11$ ☹

NOTE: The "C" sentence is NOT correct $(12 \neq 11)$
The answer (7) is incorrect.
We must redo the problem

$x + 5 = 11$	B: $(x) + 5 = 11$
$x = 6$	S: $(6) + 5 = 11$
	C: $11 = 11$ ☺

A. Verify, using the B.S.C. Plan:

1. $3x = 12$
answer: $x = 4$
B: $3(x) = 12$
S : $3(4) = 12$
C: $12 = 12$ ☺

2. $5x = 25$
answer: $y = 5$

B:

S:

C:

3. $7x = 35$
answer: $y = 5$

B:

S:

C:

4. $2x - 5 = 21$
answer: $x = 13$

B: $2(x) - 5 = 21$

S: $2(13) - 5 = 21$

C: $26 - 5 = 21$
$21 = 21$ ☺

5. $3x - 1 = 11$
answer: $x = 4$

B:

S:

C:

6. $2x + 6 = 16$
answer $x = 5$

B:

S:

C:

7. $3x - 5 = 16$
answer: $x = 7$

B:

S:

C:

8. $7x = 56$
answer: $x = 9$

B:

S:

C:

9. $8x + 9 = 25$
answer: $x = 3$

B:

S:

C:

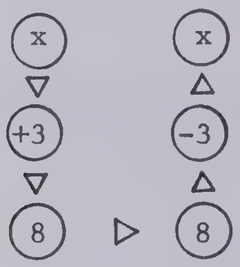
10. $3x + 5 = 26$
answer : $x = 7$

B:

S:

C:

Example 1: $x + 3 = 8$



or

If
$x + 3 = 8$
then
$8 - 3 = x$
$\therefore x = 5$

Therefore $x = 8 - 3$
$x = 5$

Remember SUBTRACTION is the opposite operation of ADDITION!

Exercise 1:

a. $a + 3 = 12$

b. $b + 6 = 30$

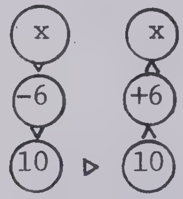
c. $x + 12 = 40$

d. $n + 16 = 36$

e. $a + 10 = 500$

f. $x + 23 = 75$

Example 2: $x - 6 = 10$



or

If
$x - 6 = 10$
then
$10 + 6 = x$
$\therefore x = 16$

Therefore $x = 10 + 6$

$x = 16$

Exercise 2:

a. $x - 4 = 100$

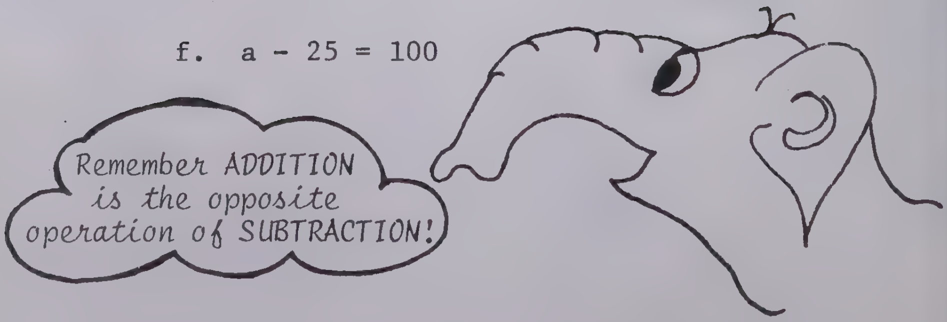
b. $a - 8 = 12$

c. $b - 10 = 60$

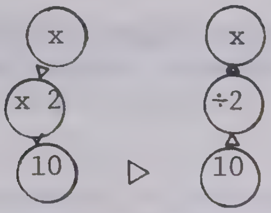
d. $n - 15 = 45$

e. $x - 35 = 70$

f. $a - 25 = 100$


Remember ADDITION is the opposite operation of SUBTRACTION!

Example 3: $2x = 10$



therefore $x = 10 \div 2$
$= 5$

Exercise 3:

a. $3x = 15$

b. $4x = 20$

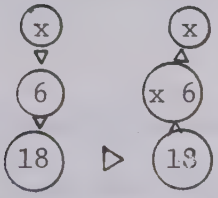
c. $16x = 32$

d. $5a = 25$

e. $10b = 80$

f. $3x = 300$

Example 4: $\frac{x}{6} = 18$



therefore $x = 18 \times 6 = 108$

Exercise 4:

a. $\frac{x}{3} = 9$

b. $\frac{x}{10} = 100$

c. $\frac{x}{5} = 125$

d. $\frac{x}{2} = 48$

e. $\frac{x}{4} = 16$

f. $\frac{x}{6} = 4$

Remember MULTIPLICATION is the opposite operation of DIVISION.

Exercise 5:

a. $x + 13 = 63$

b. $a - 26 = 100$

c. $5n = 35$

d. $\frac{x}{7} = 7$

e. $\frac{n}{8} = 7$

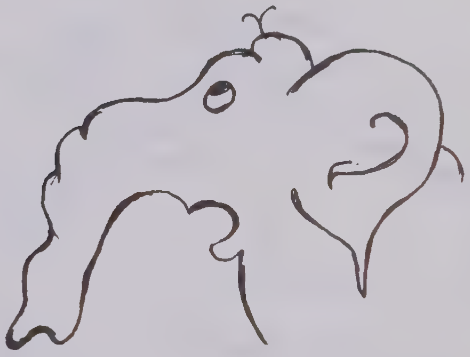
f. $7n = 63$

g. $9n = 54$

h. $x - 15 = 75$

i. $x + 15 = 75$

j. $\frac{n}{6} = 7$



Remember to use the opposite operation to solve.

Exercise 6:

What's the difference between a teacher and a train?

Directions:

Solve each equation.
Find the answer to each equation in the boxes at the bottom.
Transfer the word from the equation to the proper box.
Work until you have found the answer to the riddle.

$\frac{n}{4} = 16$: The

$x + 10 = 31$: Spit

$y - 3 = 40$: Teacher

$3x = 36$: Says

$\frac{y}{3} = 10$: Train

$x - 13 = 80$: Gum

$n - 10 = 89$: Out

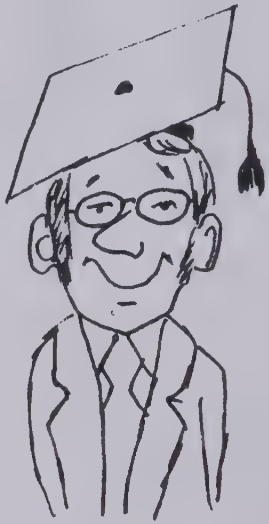
$n + 17 = 23$: Chew

$6x = 48$: The

$5x = 100$: Says

$\frac{n}{5} = 9$: Your

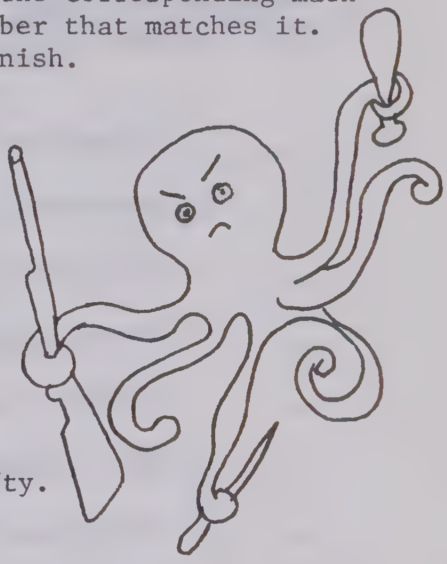
$\frac{t}{2} = 96$: Chew



64	43	12	21	99	45	93 , Gum
8	30	20	6,	192.		

A. *How does an octopus go into battle?*

Match the following English sentences with the corresponding mathematical sentences. Put the letter beside the number that matches it. You will have the answer to the riddle when you finish.



____ 1. a number is four more than seven.

____ 2. One more than a number is twenty.

____ 3. Fourteen is three more than a number.

____ 4. Twice some number is ninety-two.

____ 5. The sum of a number and seventeen is fifty.

____ 6. A number is four less than seven.

____ 7. A number multiplied by fifteen is sixty.

____ 8. A number plus two is ninety-two.

____ 9. Fifteen more than a number is sixty.

E. $x + 1 = 20$

A. $x + 17 = 50$

M. $x(15) = 60$

L. $14 = x + 3$

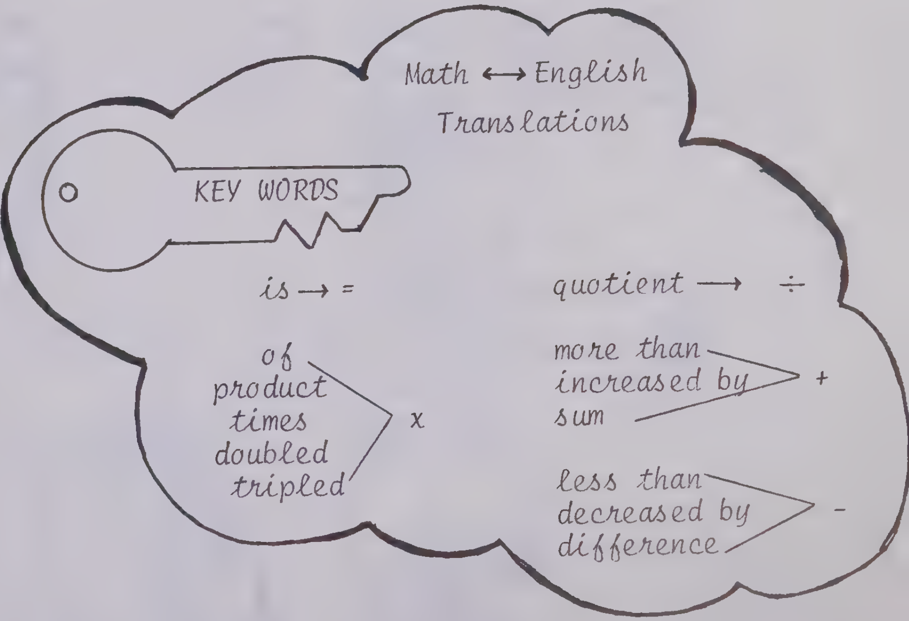
R. $x = 7 - 4$

D. $15 + x = 60$

L. $2(x) = 92$

W. $x = 7 + 4$

E. $x + 2 = 92$



B. *What girl is always making errors?*

Match the following English sentences with the corresponding mathematical ones. Put the letter beside the number that matches it. You will have the answer to the riddle when you finish.

____ 1. Five times a number is ninety.

____ 2. Seventeen times a number is thirty-four.

____ 3. Nine times a number is eighty-one.

____ 4. Three times a number is twelve more than the number.

____ 5. Fifty is twenty-five times a number.

____ 6. The product of five and eleven is the number.

____ 7. The product of forty-one and a number is four hundred ten.

____ 8. The sum of four and a number is the product of five and eight.

E. $4 + n = 5 \times 8$

A. $5 \times 11 = n$

S. $9 \times n = 81$

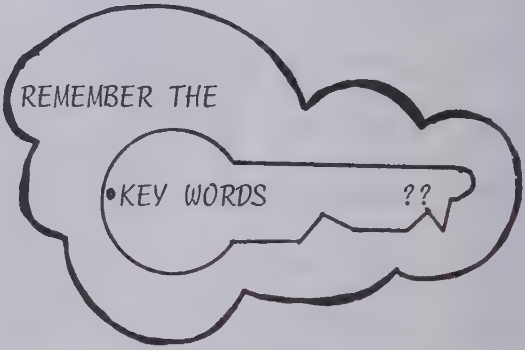
M. $5 \times n = 90$

K. $41 \times n = 410$

I. $17 \times n = 34$

T. $50 = 25 \times n$

S. $3 \times n = n + 12$



C. *What do you break by naming it?*

Match the following English sentences with the corresponding mathematical sentences. Put the letter beside the number that matches it. You will have the answer to the riddle when you finish.

____ 1. A number divided by five is twenty.

____ 2. A number divided by nine is nine.

____ 3. Thirty-four divided by a number is two.

____ 4. Seventy-two divided by eight is a number.

____ 5. Fifty-six divided by eight is a number.

____ 6. Seventy-five is a number divided by one.

____ 7. Zero divided by a number is zero.

L. $34 \div n = 2$

E. $0 \div n = 0$

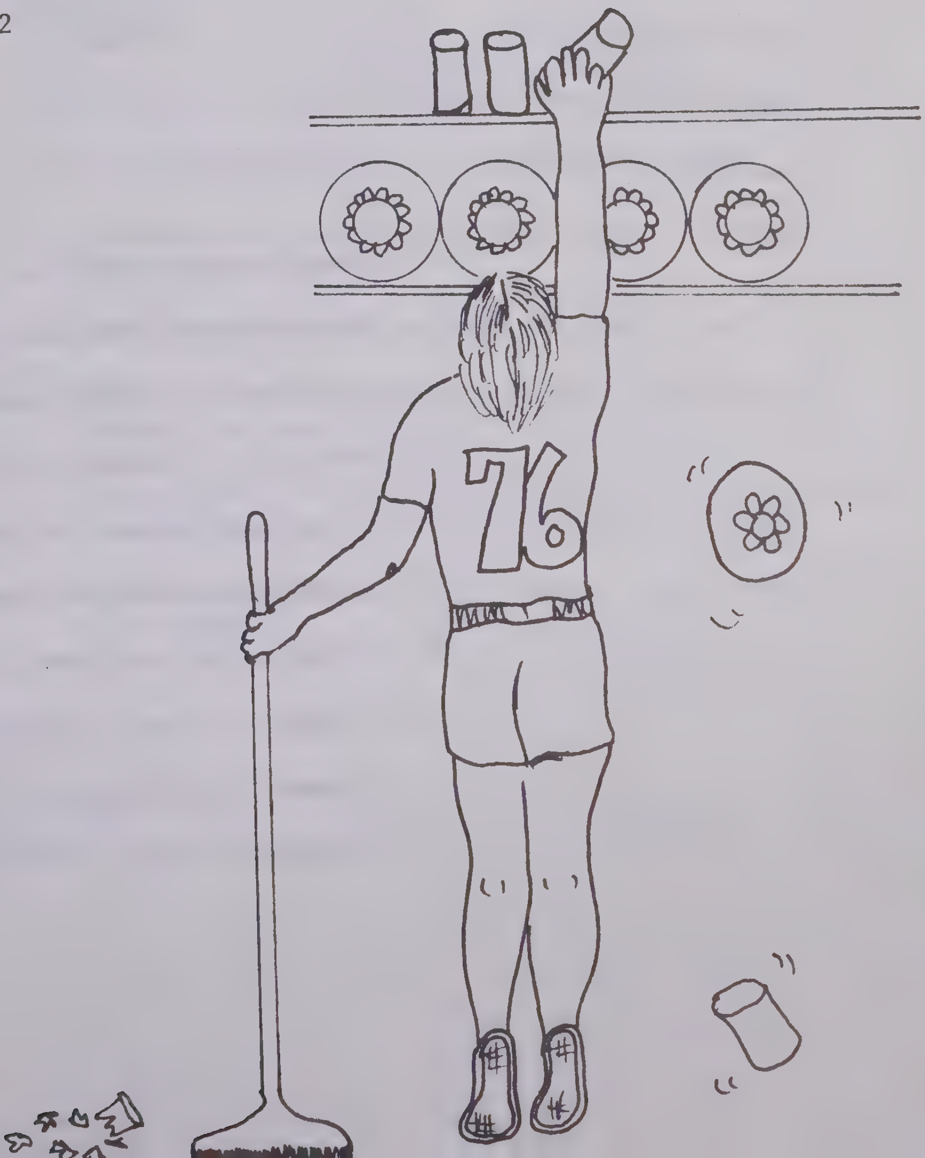
S. $n \div 5 = 20$

E. $72 \div n = 8$

N. $56 \div 8 = n$

I. $n \div 9 = 9$

C. $75 = n \div 1$



Match the following mathematical sentences with the corresponding English sentences. Put the letter beside the number that matches it. You will have the answer to the riddle when you finish.

D. *What do you buy if you are dying and have only 15 cents?*

____ 1. $51 = n - 30$

____ 2. $61 = n - 22$

____ 3. $n < 51$

____ 4. $n < 30$

____ 5. $n < 22$

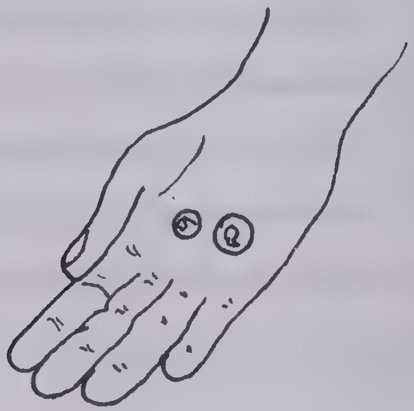
____ 6. $n = 50 - 1$

____ 7. $n = 60 - 1$

____ 8. $2n < 30$

____ 9. $3 < n$

____ 10. $3 = n - 2$



R. Three is two less than a number.

E. Three is less than the number.

A. Fifty-one is thirty less than the number.

L. Sixty-one is twenty-two less than the number.

V. Twice some number is less than thirty.

A. A number is one less than sixty.

I. A number is less than fifty-one.

F. A number is less than thirty.

S. A number is one less than fifty.

E. A number is less than twenty-two.

E. *What do you find at the end of everything?*

Match the following mathematical sentences with the corresponding English sentences by putting the letter beside the number that matches it. You will have the answer to the riddle when you finish.

____ 1. $2n = 6 + 8$

____ 2. $n - 3 = 2n$

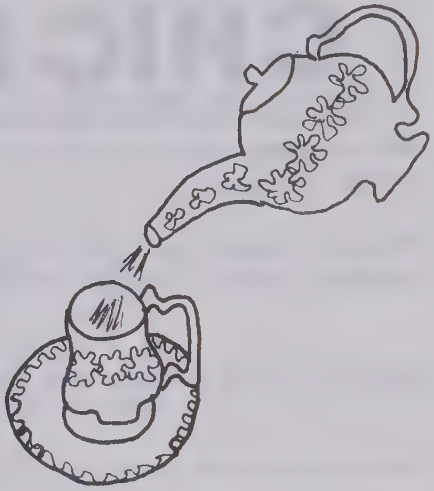
____ 3. $17 + n = 41$

____ 4. $5 \times n = 6 + 24$

____ 5. $39 \div 13 = n + 1$

____ 6. $n \times 10 = n + 90$

____ 7. $70 + 2n = 20 + 70$



E. Three less than a number is twice the number.

T. Seventeen more than a number is forty-one.

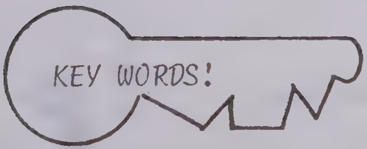
G. Seventy more than twice some number is twenty more than seventy.

L. Twice some number is eight more than six.

R. The product of a number and ten is the sum of a number and ninety.

T. The product of five and a number is six more than twenty-four.

E. Thirty-nine divided by thirteen is one more than the number.



F. Write mathematical sentences to describe the following. (Do not solve).

FRYING CHICKEN $1.75/kg

1. If the Partrige Poultry Shop has a sale on chicken at the above price, make a mathematical sentence to show the cost of a two kilogram frying chicken.

2. Chuck N. Hawk paid 545 cents for a chicken. How many kilograms did his chicken weigh? Write a mathematical sentence to describe the problem.

G. Martha's Meat Market has the following sale on beef.

SIDES $1.65/kg

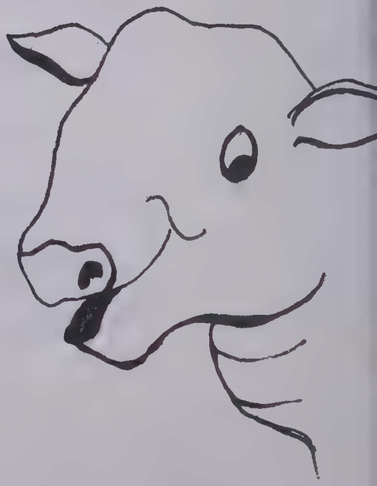
Cut and wrapped. Government inspected.

Fronts kg $1.55
Hinds kg $1.75

Write mathematical sentences to describe the following. (Do not solve.)

1. Mr. U. Bettcher paid cash for a side of beef weighing 70 kilograms. How much did he pay?

2. A thirty-five kilogram front costs how much more than a twenty kilogram hind?



In solving problems we use the following steps:

Read the problem carefully.

Define the unknown.

Write a mathematical sentence. (condition)

Solve the unknown.

Write a concluding sentence answering the question in the problem.

Check to see if your answer is reasonable.

Example: Tom collects hockey cards. If we take the number of cards Tom has and multiply by 3, we get 150. How many cards does Tom have?

Step 1: Read the problem carefully.

Step 2: Let x be the number of cards Tom has.

Step 3: $x \times 3 = 150$

Step 4: $x = 150 \div 3$
$x = 50$

Step 5: Tom has 50 cards.

Step 6: Could Tom have 50 cards? Yes. The answer is reasonable.

EXERCISES: UNIT II OBJECTIVE NO. 18

ANCIENT PROVERB:

90 A sailor	9	50	8	45	100
25	20	5	13	39	6

Solve the problems below. Write the expression corresponding to the problem in the box containing the correct solution to that problem The first one is done for you.

A Sailor: A number divided by 3 is 30. What is the number?

As A Dirty: Bill said, "if you add 20 to my age the result is 33 years." H How old is Bill?

Crosses: Jane has 10 more pennies than dimes. If Jane has 40 dimes, how many pennies does Jane have?

A Bath: If you divide a number by 10 you will get 2. What is your number?

Is Known: The product of 12 and what number is 60?

The Ocean: Bobby had 30 chocolate bars. After he gave some away, he had 22 left. How many did he give away?

Taking: If you multiply a number by 6, you will get 150. What is the number?

Twice: If you multiplied Julie's weight by 2, you would get 150. What is Julie's weight?

Crosser: A school bought some basketballs. If they bought five balls for $30.00, how much did they pay for each ball?

Who: The product of a number and 7 is equal to 63. What is that number?

Without: Betty had a bug collection. If we multiply the number of bugs by 10, we get 1000. How many bugs does Betty have?

Double: If you divide a number by 3, you get 13. What is that number?

MATH BINGO

- a game to cover all objectives on whole numbers, grade seven level.

Make a set of call cards with the following questions. Put one question and its answer on each card.

Make a set of bingo cards for the students, using any 5 of the B answers, 5 of the I answers, 5 of the G answers, 5 of the O answers and 4 of the N answers (regular Bingo card format). Also have a supply of markers.

Give each student a card and markers. Shuffle the call cards and call out one at a time allowing time for the necessary calculation. The answers are on the call cards to make it easy to confirm the "bingo".

CALL CARDS	ANSWERS	
B: An expanded numeral for 47 is	(4 x 10) + (7 x 1)	B
B: An expanded numeral for 423 is	(4 x 100) + (2 x 10)+ (3x1)	B
B: An expanded numeral for 305 is	(3 x 100) + (0 x 10) + (5 x 1)	B
B: An expanded numeral for 123 is	(1 x 100) + (2 x 10) + (3 x 1)	B
B: The standard form for (5 x 100) + (2 x 10) + (3 x 1) is	523	B
B: The standard form for (1 x 1000) + (2 x 100) + (0 x 10) + (0 x 1) is	1200	B
B: The standard form for (7 x 10) + (7 x 1) is	77	B
B: The standard form for (6 x 10) + (2 x 1) is	62	B

CALL CARDS	ANSWERS	
B: One addend in 23 + 39 = 62 is	23	B
B: The sum in 333 + 2 = 335 is	335	B
I: The subtrahend in 335 - 1 = 334 is	1	I
I: The difference in 335 - 1 = 334 is	334	I
I: The product of 3 x 4 is	12	I
I: In 4 x 10 = 4, the multiplier is	10	I
I: In 63 ÷ 9 = 7, the divisor is	9	I
I: The quotient of 0 ÷ 5 is	0	I
I: 17 + 0 =	17	I
I: 21 - 0 =	21	I
I: 63 x 1 =	63	I
I: 250 ÷ 1 =	250	I
N: 3 x 2 + 8 =	14	N
N: 12 ÷ 3 x 2 =	8	N
N: 12 - 9 + 8 ÷ 4 =	5	N

CALL CARDS	ANSWERS	
N: (18 - 8) ÷ 5 =	2	N
N: Another way of writing 12 x 4 is	12(4)	N
N: Another way of writing 12 ÷ 4 is	$\frac{12}{4}$	N
N: Another way of writing 5x is	5(x)	N
N: Another way of writing 4 x 41 is	4(41)	N
G: Evaluate n + n when the replacement set is (2, 4, 6)	(4,8,12)	G
G: Evaluate n x n when the replacement set is (2,4,6)	(4, 16, 36)	G
G: Evaluate 3n when the replacement set is (1, 2, 3)	(3, 6, 9)	G
G: Evaluate 3 + n when the replacement set is (1,2,3)	(4,5,6)	G
G: Find n n + 3 = 7	4	G
G: Find n 4(n) = 20	5	G
G: Find n n ÷ 6 = 3	18	G
G: Find n n - 6 = 20	26	G

CALL CARDS	ANSWERS	
G: Find n n + 18 = 20	2	G
O: Find n n x 1 = 24	24	O
O: Find n 8n = 56	7	O
O: A mathematical sentence for "A number is twenty-six"	n = 26	O
O: A mathematical sentence for "Ten increased by a number results in twenty-six"	10 + n = 26	O
O: A mathematical sentence for "A number divided by twelve equals five"	n ÷ 12= 5	O
O: A mathematical sentence for "Five less than a number is twelve"	n - 5 = 12	O
O: Solve the problem: Joe had twenty Batman comic books. He bought more and then he had thirty one. How many did he buy?	11	O
O: Solve the problem: Mary had thirty-one chocolate bars. She gave some away and had twenty-three left. How many did she give away?	8	O
O: Solve the problem: Joe has seventeen nickels. He has five times as many dimes. How many dimes does he have?	85	O
O: Paula bought seven books for twenty-one dollars. How many dollars did each book cost?	3	O

KEY TO EXERCISES

LEVEL 7

UNIT II

WHOLE NUMBERS

KEY TO EXERCISES

Objective No. 3

A. Let's Expand

5 = 5 x 1
45 = 4 x 10 + 5 x 1
237 = 2 x 100 + 3 x 10 + 7 x 1
639 = 6 x 100 + 3 x 10 + 9 x 1
758 = 7 x 100 + 5 x 10 + 8 x 1
303 = 3 x 100 + 0 x 10 + 3 x 1
76 = 7 x 10 + 6 x 1

Word for rhyme: Expanded.

B. 1. 7 x 1
2. (1 x 10) + (8 x 1)
3. (7 x 10) + (3 x 1)
4. (1 x 100) + (1 x 10) + (4 x 1)
5. (2 x 100) + (5 x 10) + (9 x 1)
6. (9 x 100) + (0 x 10) + (3 x 1)
7. (1 x 1 000) + (2 x 100) + (3 x 10) + (1 x 1)
8. (9 x 1 000) + (6 x 100) + (8 x 10) + (2 x 1)
9. (8 x 100) + (7 x 10) + (6 x 1)
10. (5 x 10) + (0 x 1)

C. A Lot of Bull

m. 1 000
a. 1
o. 100
b. 10 000
e. 10 000 000

l. 1 000 000
n. 10
i. 100 000

Answer: Abominable
(a bomb in a bull)

D. 1. a. 10 000 or 10 x 10 x 10 x 10
b. 1 000 or 10 x 10 x 10
c. 100 or 10 x 10
d. 10
e. 1

2.

	100 000	10 000		100	10	1
10x10x10x10x10x10	10x10x10x10x10		10x10x10			

Objective No. 3 Cont'd

E. 1. 937 = (9 x 100) + (3 x 10) + (7 x 1)
2. 1972 = (1 x 1 000) + (9 x 100) + (7 x 10) + (2 x1)
108 = (1 x 100) + (0x 10) + (8 x 1)
107 = (1 x 100) + (0 x 10) + (7 x 1)

3. 63 = (6 x 10) + (3 x 1)
4. 40 = (4 x 10) + (0 x 1)
5. 2 000 = (2 x 1 000) + (0 x 100) + (0x 100) + (0 x 1)
6. 15 332 = (1 x 10 000) + (5 x 1 000) + (3 x 100) + (3 x 10) + (2 x1)
7. a. 83 796 = (8 x 10 000) + (3 x 1 000) + (7 x 100) + (9 x 10) + (6 x 1)
b. 1 972 = (1 x 1 000) + (9 x 100) + (7 x 10) + (2 x 1)

F. 1a. 23 = twenty-three.
b. 1944 = one thousand, nine hundred forty-four
c. 15 = fifteen

2a. 1973 = one thousand, nine hundred seventy-three
b. 239 = two hundred thirty-nine

3a. 1972 = one thousand, nine hundred, seventy-two
b. 1973 = one thousand, nine hundred, seventy-three
c. 888 = eight hundred eighty-eight.

4a. 502 = five hundred two

5a. 9 166 = nine thousand, one hundred sixty-six
b. 1 950 = one thousand, nine hundred fifty

6a. 1 605 = one thousand, six hundred five

7a. 10 014 = ten thousand, fourteen

8a. 15 000 = fifteen thousand
b. 28 = twenty-eight
c. 1 972 = one thousand nine hundred seventy two

Objective No. 3

9.a. $87 500 = eighty **seven** thousand, five hundred dollars

10a. 1 972 = one thousand, nine hundred seventy two
b. 52 546 = fifty two thousand, five hundred forty-six

Objective No. 4

A.

1 - N
2 - F
3 - A
4 - T
5 - C
6 - U
7 - H
8 - E
9 - R
10 - D
11 - O

The decoded words are: The centre of a donut

B. Who is this Woman?

1. 797 328
2. 2 072
3. 659
4. 1 090
5. 502
6. 6 934
7. 500
8. 675
9. 10 000
10. 9
11. 57
12. 59 671
13. 5 000 000
14. 20 000
15. 100 000
16. 405
17. 98

18. 6 000 000 The $6 000 000 Woman

C.
1. 56
2. 427
3. 91
4. 6 536
5. 8 920
6. 18 749
7. 2 511
8. 599
9. 7 503

11. 2 006
12. 597
13. 12 345
14. 5 086,000
15. 211
16. 509
17. 99 342
18. 7 165
19. 10 500 105

Key to Exercises

Objective No. 4

D. Animal Puzzle

1. 73
2. 937
3. 8 795
4. 57
5. 51 120
6. 9
7. 7 963
8. 5 399
9. 20
10. 989
11. 8 289
12. 134

A weiner dog - sausage daschund

Objective No. 5

A. 1. 9 addend
2. 22 sum
3. 5 addend
4. 138 sum
5. 181 sum

B. 1. 22
2. 38
3. 37
4. 30
5. 33
6. 27
7. 23
8. 35

You will never be as big as I am!

C. 1a. 19
b. 19
c. 19
d, 29
e. 57
f. 89
g. 99
h. 89
i. 98
j. 59

2a. 66
b. 108
c, 68
d. 88
e. 99
f. 89
g. 104
h. 39
i. 59
j. 89

3a. 177
b. 219
c. 529
d. 786
e. 504
f. 730
g. 518
h. 909
i. 510
j. 698

4a. 101
b. 66
c. 77
d. 51
e. 103
f. 50
g. 65
h. 87
i. 62
j. 72

5a. 73
b. 113
c. 111
d. 138
e. 145
f. 123
g. 124
h. 116
i. 131
j. 99

6a. 1 075
b. 665
c. 781
d. 803
e. 393
f. 291
g. 202
h. 529
i. 693
j. 532

7a. 1 371
b. 620
c. 1 864
d. 1 134
e. 1 254
f. 1 447
g. 1 614
h. 1 451
i. 1 177
j. 879

8a. 10 929
b. 9 164
c. 8 763
d. 10 240
e. 9 531
f. 18 515
g. 10 759
h. 5 065
i. 9 600
j. 8 394

D. It is easy to shut up your math text. It is not as easy to shut up your math teacher !

E. A $ $ $ Matter

$32 more than $30

Key to Exercises

Objective No. 5

F. The Subtraction Family

1.	minuend	hoe
2.	subtrahend	hoe
3.	difference	hoe

G. 1.
a. 54
b. 90
c. 71
d. 52
e. 71
f. 81
g. 56
h. 91
i. 71
j. 82

2.
a. 455
b. 511
c. 303
d. 431
e. 561
f. 261
g. 510
h, 333
i. 822
j. 911

3.
a. 264
b. 511
c. 161
d. 201
e. 314
f. 241
g. 421
h. 120
i. 221
j. 605

4.
a. 82
b. 48
c. 58
d. 39
e. 28
f. 41
g. 75
h. 59
i. 46
j. 84

5.
a. 18
b. 18
c. 4
d. 19
e. 26
f. 37
g. 7
h. 13
i. 49
j. 78

6.
a. 381
b. 673
c. 489
d. 369
e. 681
f. 758
g. 165
h. 391
i. 379
j. 767

7.
a. 491
b. 89
c. 86
d. 69
e. 128
f. 146
g. 288
h. 39
i. 569
j. 55

H. 1. 2 127
2. 3 788
3. 5 098
4. 7 996
5. 1 706
6. 2 436
7. 4 129
8. 7 014
9. 2 627
10. 8 829
11. 7 524
12. 4 296
13. 8 920
14. 3 869
15. 5 207
16. 1 606
17. 1 391
18. 35 547
19. 5 905
20. 1 788

I. 1. 6
2. 10
3. 100
4. 55
5. 832
6. 5 093
7. 9 383
8. 18 000

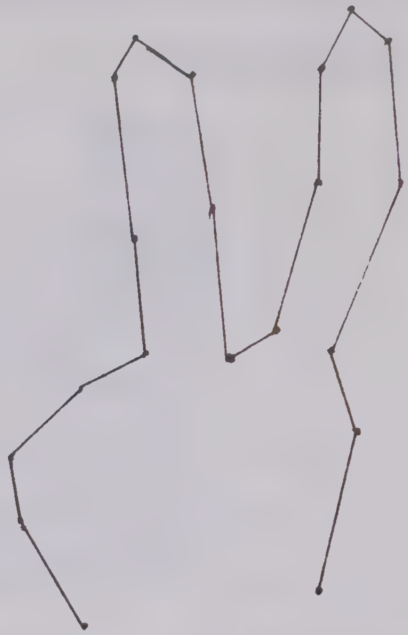
The grand sum is 33 479

Key to Exercises

Objective No. 5

J. Familiar Sign of Our Times

1. 73
2. 56
3. 80
4. 476
5. 20
6. 970
7. 603
8. 11 540
9. 17
10. 12
11. 70
12. 229
13. 45
14. 0
15. 608
16. 23 234
17. 87 266
18. 1
19. 5
20. 1 516



Objective No. 6

A. 1. b. multiplier
c. product

2. a. multiplicand
b. product

3. a. multiplicand
b. multiplier

4. a. multiplicand
b. multiplier
c. product

5. a. product
b. multiplier
c. multiplicand

6. a. product
b. multiplier
c. multiplicand

B. 1. A - 616
2. N - 486
3. O - 240
4. M - 4 771
5. P - 52 416
6. E - 83 000
7. H - 243
8. U - 8 090
9. I - 2 662
10. E - 1 428
11. O - 4 095
12. Y - 2 592
13. T - 7 440
14. R - 3 956
15. L - 13 936
16. D - 18 660

You drop them a line.

C. I. - 3 740
O. - 2 958
T. - 1 110
N. - 1 728
O. - 1 248
N. - 3 808
U. - 870
B. - 2 992
S. - 7 347
B. - 342
R. - 12 960
H. - 17 250
S. - 2 704
Y. - 40 110
U. - 42 480
O. - 314 400
O. - 46 656
F. - 26 316
N. - 228 390
J. - 749 844
K. - 75 296
C. - 344 191
B. - 271 232

John Bucyk of Boston Bruins

Objective No. 6

D. 1. b. quotient
c. dividend

2. a. divisor
b. quotient

3. a. dividend
b. divisor

4. a. dividend
b. divisor
c. quotient

5. a. divisor
b. quotient
c. dividend

6. a. dividend
b. divisor
c. quotient

E. A - 8

E - 16

C - 42

D - 53

S - 57

A - 225

N - 17

U - 40

K - 18

L - 20

Y - 29

A - 56

E - 58

B - 38

S - 19

A Black-eyed Susan

F. 1. 17

2. 29

3. 67

4. 701 r 2

5. 25

6. 162

7. 49 r 6

8. 276 r 3

9. 125

10. 22

11. 27 r 30

12. 415 r 17

13. 71

14. 50 r 106

15. 160

16. 886 r 7

17. 94 r 2

18. 13 r 129

19. 526 r 59

20. 20 r 264

Key to Exercises

Objective No. 6

69	49 r 6	701 r 2	886 r 7	~~67~~
700 r 2	125	526 r 59	415 r 17	~~94 r 2~~
29	50 r 106	260	162	~~276 r 3~~
13 r 129	25	27 r 30	39	~~160~~
22	215 r 73	17	71	~~20 r 264~~

↑
BINGO

Objective No. 7

A.
1. 6
2. 9
3. 5
4. 8
5. 19
6. 28
7. 89
8. 101
9. 240
10. 115

B.
1. 18
2. 21
3. 39
4. 1
5. 0
6. 44
7. 205
8. 1 041
9. 78
10. 54

C. All Answers are 0.

D.
1. 6
2. 5
3. 24
4. 13
5. 18
6. 404
7. 44
8. 115
9. 75
10. 22

E.
1. 41
2. 26
3. 7
4. 180
5. 16

F. All answers are 0.

G. All answers are 0.

H.
1. 0
2. 24
3. 16
4. 1
5. 28
6. 45
7. 0
8. 10
9. 64
10. 29

Solution to riddle:

When you die, you kick the bucket.

When you faint, you turn a little pale.

Key to Exercises

Objective No. 10

Part I

Exercise A:

1. 16
2. 25
3. 20
4. 20
5. 52
6. 53
7. 95
8. 93
9. 167
10. 167

Exercise B:

1. 90
2. 24
3. 100
4. 70
5. 84
6. 560
7. 165
8. 1 080
9. 1 400
10. 2 760

Exercise C:

1. 1
2. 3
3. 8
4. 2
5. 7
6. 10
7. 8
8. 10
9. 19
10. 12

Exercise D:

1. 4
2. 1
3. 5
4. 1
5. 4
6. 2
7. 3
8. 17
9. 8
10. 3

Exercise E:

1. 6
2. 12
3. 11
4. 15
5. 16
6. 20
7. 6
8. 20
9. 17
10. 18

Exercise F:

1. 7
2. 12
3. 60
4. 36
5. 4
6. 4
7. 87
8. 3
9. 32
10. 14

Exercise G:

1. 38
2. 20
3. 14
4. 44
5. 11
6. 26
7. 0
8. 19
9. 58
10. 36
11. 44
12. 98

Objective No. 10

Part II

1. 5
2. 2
3. 40
4. 92
5. 72
6. 79
7. 4
8. 4
9. 120
10. 470
11. 8
12. 0
13. 2
14. 13
15. 0
16. 13
17. 9
18. 90
19. 2
20. 96

Part III

A.

1. 9
2. 2
3. 63
4. 83
5. 108
6. 54
7. 10
8. 51
9. 53
10. 20
11. 135
12. 168
13. 21
14. 90

Answer to riddle: Nothing. Monkeys can't talk.

Pumpernickel during inflation: Pumperdime.

Objective No. 11

Riddle: When it hugs the shore

Key to Exercises

Objective No. 12

Exercise A:

Store 1	Store 2
$140	$120
$75	$65
$65	$55
$35	$30

Exercise B:

Store 1	Store 2
$20	$30
$20	$30
$13	$18
$8	$13
$2	$3

Exercise C:

Store 1	Store 2
$48	$42
$96	$84
$34	$31
$16	$13
$8	$7

A Quacky Problem: A Box of Quackers

Objective No 13:

A.	1.	a.	7	f.	57	B.	2.	a.	38	f.	69
		b.	30	g.	86			b.	39	g.	122
		c.	22	h.	261			c.	76	h.	158
		d.	50	i.	147			d.	79	i.	100
		e.	8	j.	301			e.	93	j.	167

C.	3.	a.	7	f.	10	D.	4.	a.	48	f.	128
		b.	6	g.	30			b.	90	g.	68
		c.	29	h.	12			c.	180	h.	240
		d.	8	i.	12			d.	88	i.	361
		e.	12	j.	6			e.	91	j.	600

E. Review Exercise

Answer: Because the others are week days.

Key to Exercises

Objective No. 14

A. 1. correct
 2. correct
 3. correct
 4. correct
 5. correct
 6. correct
 7. correct
 8. incorrect
 9. incorrect
 10. correct

Objective No. 15

1. a. 9
 b. 24
 c. 28
 d. 20
 e. 490
 f. 52

2. a. 104
 b. 20
 c. 70
 d. 60
 e. 105
 f. 125

3. a. 5
 b. 5
 c. 2
 d. 5
 e. 8
 f. 100

4. a. 27
 b. 1 000
 c. 625
 d. 96
 e. 64
 f. 24

5. a. 50
 b. 126
 c. 7
 d. 49
 e. 56
 f. 9
 g. 6
 h. 90
 i. 60
 j. 42

6. The teacher says spit out your gum,
 the train says chew, chew.

Objective No. 17

A. Well Armed
B. Miss Take
C. Silence
D. A Lifesaver
E. Letter G

F. 1. $2 \times 1.75 = n$
 2. $545 \div 1.75 = n$

G. 1. $70 \times 1.65 = n$
 2. $(35 \times 1.55) - (20 \times 1.75) = n$

Objective No. 18

A Sailor who crosses the ocean twice without taking a bath is known as a dirty double crosser.

RATIONAL NUMBERS

LEVEL 7

UNIT III

CONTENTS

Unit III - Rational Numbers

B. Fractional Numerals:

PAGE

OBJECTIVE 1: Maintain previously developed skills and ideas: numerators, denominators, basic fractions, equivalent fractions, mixed numerals, improper fractions, and the order of fractions. .... 90.

OBJECTIVE 3: Recognize fractional numerals of the form $\frac{a}{b}$ as: .... 99.

- a. part of a whole
- b. part of a group
- c. a measure
- d. a ratio
- e. division

OBJECTIVE 6: Demonstrate the use of identity elements and zero property. .... 100.

OBJECTIVE 7: Generate sets of equivalent fractions (Limit: 5). .... 102.

OBJECTIVE 10: Perform the operations of addition and subtraction with fractional numbers.(Limit: 1 digit denominators) .... 105.

OBJECTIVE 11: Demonstrate the use of reciprocals to obtain the identity element. .... 109.

OBJECTIVE 12: Perform the operations multiplication and division with fractional numbers. (Limit: 1 digit denominators) .... 111.

OBJECTIVE 15: Evaluate expressions involving order of operations. Example: $(\frac{3}{4} \times \frac{4}{5} + \frac{6}{12} \div \frac{3}{4} =)$ .... 114.

OBJECTIVE 16: Order fractional numerals using the symbols <, >, = ... 115.

C. Decimals:

PAGE

OBJECTIVE 2: Write any decimal numeral in expanded form. (Use exponential notation only if previously taught). .... 119.

OBJECTIVE 3: Write any decimal numeral in standard form given expanded form. (Use exponential notation only if previously taught). .... 122.

OBJECTIVE 4: Order decimal numerals using the symbols $<$, $>$, $=$ . ... 125.

OBJECTIVE 5: Demonstrate knowledge of decimals by plotting a given set on the number line. .... 125.

OBJECTIVE 6: Perform operations of addition and subtraction with decimal numerals. .... 130.

OBJECTIVE 8: Multiply and divide decimal numerals by powers of 10. .... 136.

OBJECTIVE 9: Perform operations of multiplication and division with decimal numerals. .... 137.

OBJECTIVE 12: Use symbols and notation illustrated below. (Use fractions and decimals). .... 139.

a. Multiplication

(i) $0.25 \times 0.1 = (0.25)(0.1)$
(ii) $0.3y = (0.3)(y) = 0.3(y)$

b. Division

(i) $\frac{0.5}{0.4} = 0.5 - 0.4 = 0.4 \quad 0.5 =$

(ii) $\frac{0.2y}{0.5} = \frac{0.2}{0.5} y = 0.2y \div 0.5 = \frac{0.2}{0.5} (y)$

OBJECTIVE 13: Evaluate expressions by substituting for the variable. .... 140.

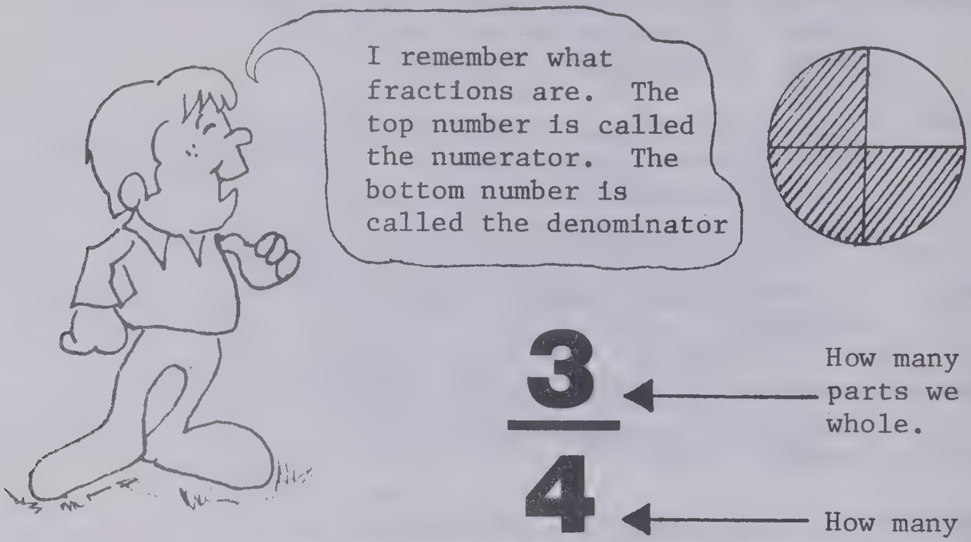
OBJECTIVE 14: Solve the following type of conditions. (Use fractions and decimals). .... 141.

a. $A + x = B$
b. $Ax = B$
c. $Ax + Bx = C$
*d. $Ax + B = C$

OBJECTIVE 15: Verify solutions of conditions by substitution. .... 143.

KEY TO EXERCISES: .... 145.

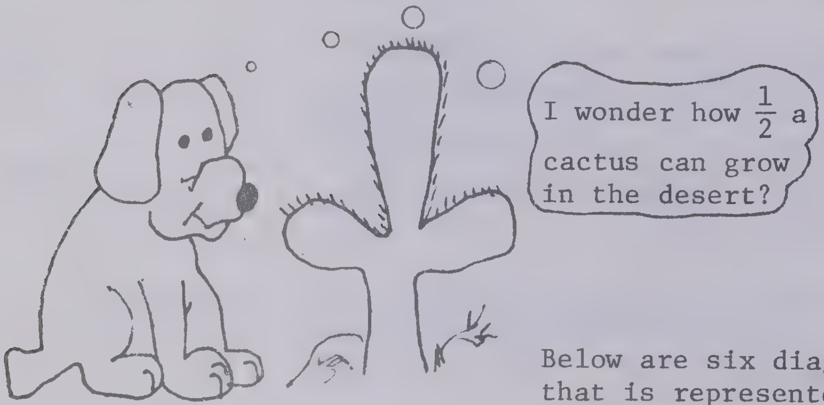
A. Fractions


I remember what fractions are. The top number is called the numerator. The bottom number is called the denominator
3
4

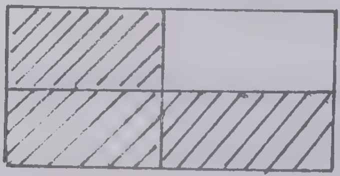
How many of the equal parts we take from the whole.

How many equal parts a whole is divided into.

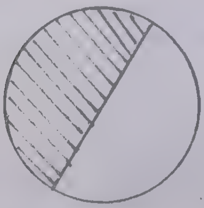
B. Fraction Pictures


I wonder how $\frac{1}{2}$ a cactus can grow in the desert?

Below are six diagrams. Give the fraction that is represented by the shaded area. The first one is done for you.

1. 

$\frac{3}{4}$ ______

2. 

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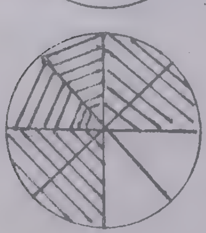
3. 

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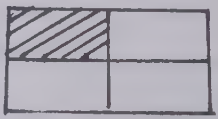
4. 

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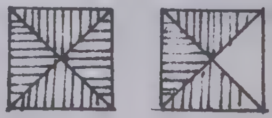
5. 

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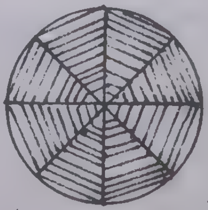
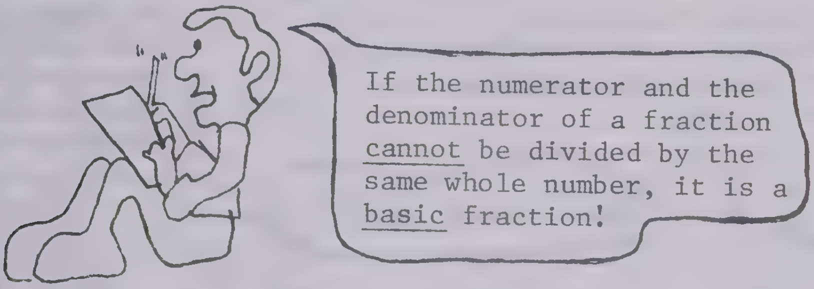
6. 

______

C. Basic Fractions


If the numerator and the denominator of a fraction cannot be divided by the same whole number, it is a basic fraction!

$\frac{4}{8}$

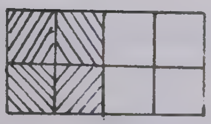
4 will divide into me.

4 will also divide into me

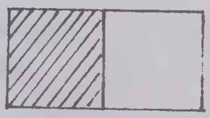
So divide us both by 4:

$\frac{4}{8} = \frac{1}{2}$

and we will become a *basic fraction*.



We are both the same amount



But I am easier to understand

1. Circle each basic fraction.

a. $\frac{3}{5}$ 1 doesn't count

b. $\frac{2}{4}$ 2 will divide into each

c. $\frac{4}{10}$

d. $\frac{2}{7}$

e. $\frac{1}{3}$

f. $\frac{5}{15}$

g. $\frac{4}{5}$

h. $\frac{3}{8}$

i. $\frac{2}{10}$

j. $\frac{13}{14}$

2. Find the basic fraction for each of the following. The first one is done for you.

a. $\frac{3}{9} \overset{\div 3}{\underset{\div 3}{=}} \frac{1}{3}$

b. $\frac{2}{4}$ = ________

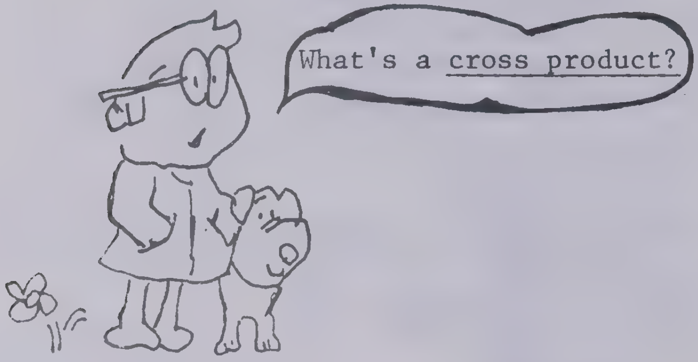
c. $\frac{6}{8}$ = ________

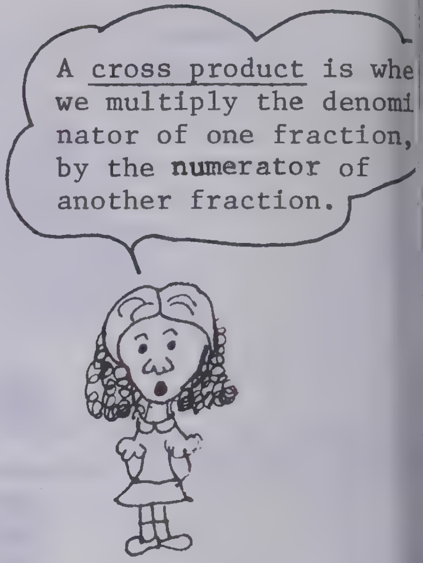
d. $\frac{5}{10}$ = ________

e. $\frac{10}{20}$ = ________

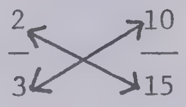
f. $\frac{6}{12}$ = ________

D. Equivalent Fractions.
Fractions are equivalent if their cross products are equal.


What's a cross product?



Example: Is $\frac{2}{3}$ equivalent to $\frac{10}{15}$?



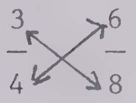
Since 3 x 10 = 30

and 2 x 15 = 30 (cross product)

and 30 = 30

then $\frac{2}{3}$ is equivalent to $\frac{10}{15}$

Now try this one by yourself.



8 x 3 = ______

4 x 6 = ______

Are the cross products (answers) equal? ________

If they are, then $\frac{3}{4}$ and $\frac{6}{8}$ are equivalent fractions.

1. Here are more examples. Put a check mark (✓) beside each pair of fractions that are equivalent.

a. $\frac{1}{4}$, $\frac{2}{8}$ ___

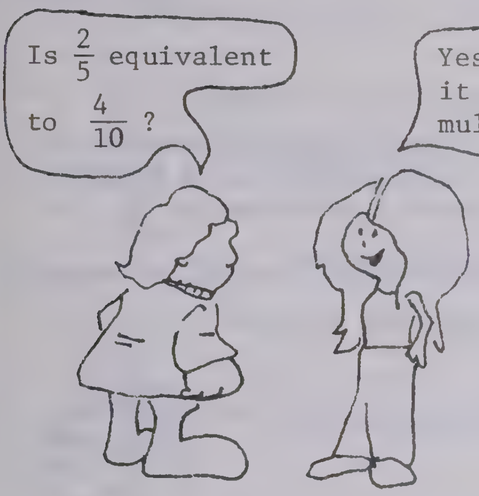
b. $\frac{2}{5}$, $\frac{3}{7}$ ___

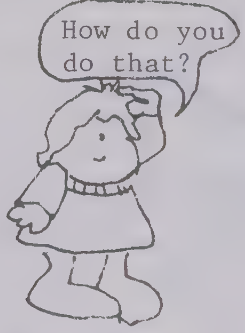
c. $\frac{1}{3}$, $\frac{5}{12}$ ___

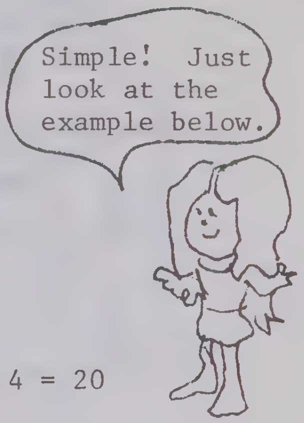
d. $\frac{2}{3}$, $\frac{5}{6}$ ___

e. $\frac{4}{7}$, $\frac{3}{8}$ ___

f. $\frac{3}{5}$, $\frac{6}{10}$ ___


Is $\frac{2}{5}$ equivalent to $\frac{4}{10}$?
Yes. You can check it out by cross-multiplying.


How do you do that?


Simple! Just look at the example below.

Example: $\frac{2}{5} \times \frac{4}{10}$

$2 \times 10 = 20$ and $5 \times 4 = 20$

Therefore $\frac{2}{5} = \frac{4}{10}$

2. Now decide which of the following pairs of fractions are equivalent.

a. $\overset{24}{\frac{2}{4}} \times \overset{24}{\frac{6}{12}}$ Yes

b. $\frac{3}{5}$, $\frac{7}{10}$

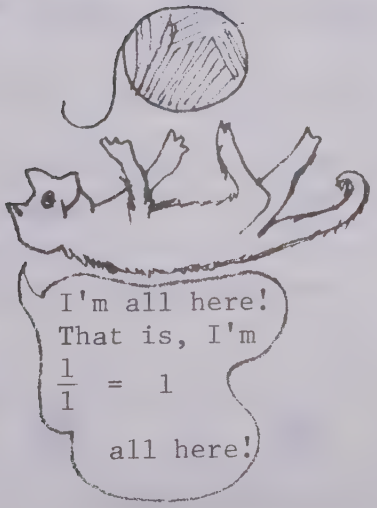
c. $\frac{3}{5}$, $\frac{10}{15}$

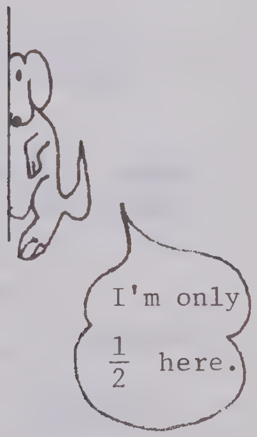
d. $\frac{9}{10}$, $\frac{18}{20}$

e. $\frac{7}{10}$, $\frac{10}{15}$

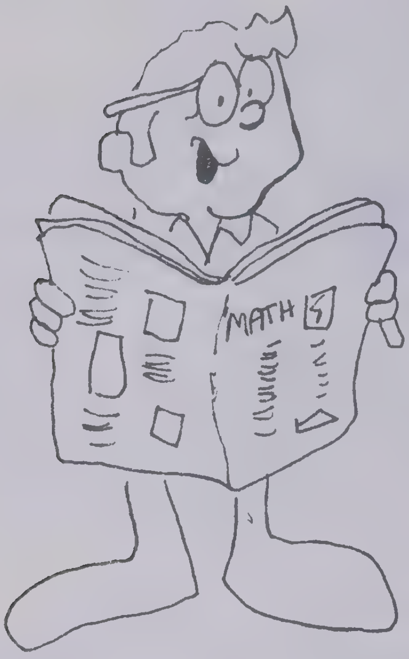
f. $\frac{3}{8}$, $\frac{7}{20}$

g. $\frac{8}{10}$, $\frac{4}{5}$


I'm all here! That is, I'm $\frac{1}{1} = 1$ all here!


I'm only $\frac{1}{2}$ here.

E. Mixed Numbers



A mixed number consists of a whole number and a fraction part. For example, $2\frac{1}{4}$ is made up of the whole number 2, and the fraction $\frac{1}{4}$.

In improper fractions the numerator is bigger than the denominator!

$\frac{5}{4}$ is an improper fraction.

Example 1:

The denominator of the mixed number and the denominator of the improper fraction will always be THE SAME!

For example: $2\frac{3}{\boxed{4}} = \frac{11}{\boxed{4}}$ or $3\frac{5}{\boxed{8}} = \frac{29}{\boxed{8}}$

To find the numerator of the improper fraction, you may use a mixed fraction converter.

MIXED NUMBER ⇒ Denominator of the fraction × Whole Number + Numerator of the fraction ⇒ NUMERATOR OF THE IMPROPER FRACTION

Examples

$2\frac{3}{4} \Rightarrow$ 4 × 2 + 3 $\Rightarrow \frac{\boxed{11}}{4}$

The Denominators are the Same!

$3\frac{5}{8} \Rightarrow$ 8 × 3 + 5 $\Rightarrow \frac{\boxed{29}}{8}$

SAME DENOMINATORS

Try these examples by yourself:

$3\frac{2}{7}$ 7 x 3 + 2 $\frac{\_\_}{7}$

SAME DENOMINATORS

$8\frac{2}{3}$ ___ x ___ + ___ $\frac{\_\_}{3}$

SAME DENOMINATORS

$4\frac{2}{5}$ ___ x ___ + ___ ___

SAME DENOMINATORS

Exercise A:

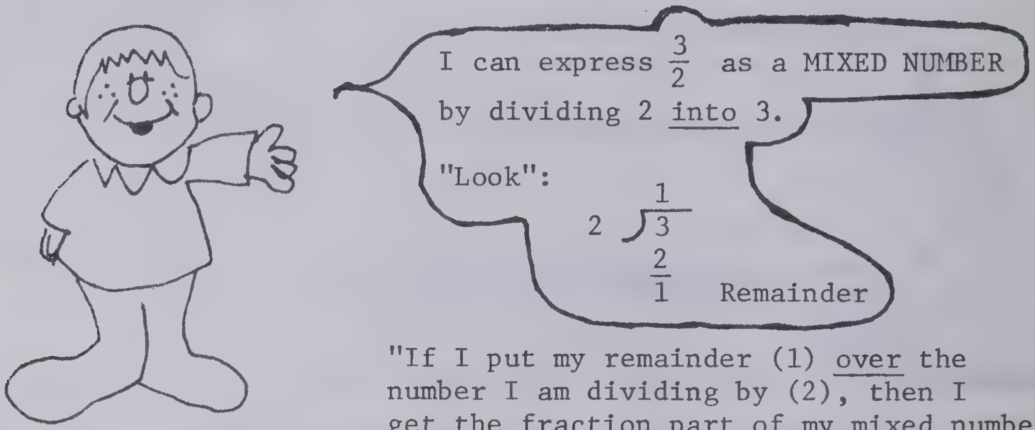
Change each of the following mixed numbers to improper fractions.

1. $1\frac{2}{3} = \frac{\_\_}{3}$
2. $2\frac{1}{4} = \frac{9}{\_\_}$
3. $1\frac{3}{5} =$ ___
4. $3\frac{4}{7} =$ ___
5. $1\frac{1}{3} =$ ___
6. $2\frac{5}{8} =$ ___
7. $11\frac{2}{3} =$ ___
8. $9\frac{2}{7} =$ ___
9. $7\frac{2}{9} =$
10. $6\frac{3}{4} =$

Example 2:

More Mixed Numbers

An improper fraction can be changed to a mixed number by dividing the denominator into the numerator.


I can express $\frac{3}{2}$ as a MIXED NUMBER
by dividing 2 into 3.
"Look":
$\begin{array}{r} 1 \\ 2\overline{)3} \\ \underline{2} \\ 1 \end{array}$
Remainder

"If I put my remainder (1) over the number I am dividing by (2), then I get the fraction part of my mixed number!"

So $\frac{3}{2}$ is $\begin{array}{r} 1 \\ 2\overline{)3} \\ \underline{2} \\ 1 \end{array} = 1\frac{1}{2}$

$\frac{5}{2}$ is $\begin{array}{r} 2 \\ 2\overline{)5} \\ \underline{4} \\ 1 \end{array} = 2\frac{1}{2}$

$\frac{25}{7}$ is $\begin{array}{r} 3 \\ 7\overline{)25} \\ \underline{21} \\ 4 \end{array} = 3\frac{4}{7}$

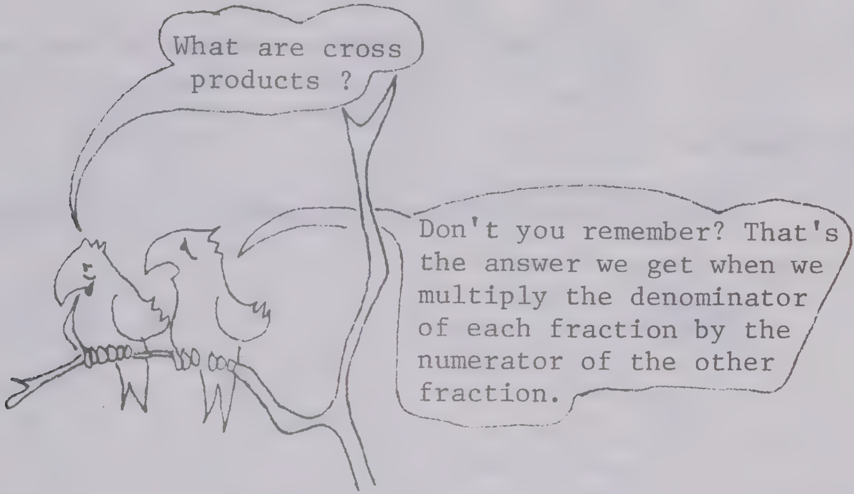
Exercise B:

Write the following as mixed numbers. The first one is done for you.

1. $\frac{5}{2} = \underline{2\frac{1}{2}}$
2. $\frac{7}{2}$ = ______
3. $\frac{5}{4}$ = ______
4. $\frac{7}{5}$ = ______
5. $\frac{4}{3}$ = ______
6. $\frac{13}{10}$ = ______
7. $\frac{25}{10}$ = ______
8. $\frac{16}{5}$ = ______

F. Order of Fractions

When we arrange each pair of fractions from smallest to largest, we find their cross products.


What are cross products ?
Don't you remember? That's the answer we get when we multiply the denominator of each fraction by the numerator of the other fraction.

Example: $\frac{2}{3} \times \frac{4}{6}$

$6 \times 2 = \underline{12}$ ← cross product

$3 \times 4 = \underline{12}$ ← cross product

Remember? If the cross products are equal, then the fractions are equivalent. So $\frac{2}{3} = \frac{4}{6}$.

But what happens if the cross products are not equal. Then one fraction must be larger or smaller than the other.

If we always write the cross product near the numerator of the fraction, then we will know which fraction is larger or smaller!

Example:

$\overset{4 \times 2 = 8}{\frac{2}{3}} \times \overset{3 \times 3 = 9}{\frac{3}{4}}$ Since 9 is larger than 8, then $\frac{3}{4}$ must be larger than $\frac{2}{3}$

$\overset{3 \times 8 = 24}{\frac{3}{5}} \times \overset{5 \times 3 = 15}{\frac{3}{8}}$ 24 is larger than 15, so $\frac{3}{5}$ is larger than $\frac{3}{8}$

Try these examples by yourself:

$\overset{\boxed{6}}{\frac{3}{4}} \times \overset{\boxed{4}}{\frac{1}{2}}$ Which fraction is larger? ________

$\overset{\boxed{}}{\frac{3}{5}} \times \overset{\boxed{25}}{\frac{5}{7}}$ Which fraction is smaller? ________

Exercise A:

Write these fractions from smallest to largest.

1. $\overset{\boxed{}}{\frac{2}{3}} \times \overset{\boxed{}}{\frac{8}{11}}$ ____ ____

2. $\frac{3}{8}$ $\frac{2}{5}$ ____ ____

3. $\frac{7}{8}$ $\frac{3}{4}$ ____ ____

4. $\frac{6}{7}$ $\frac{5}{9}$ ____ ____

5. $\frac{5}{6}$ $\frac{3}{4}$ ____ ____

6. $\frac{3}{7}$ $\frac{4}{9}$ ____ ____

7. $\frac{1}{4}$ $\frac{1}{3}$ ____ ____

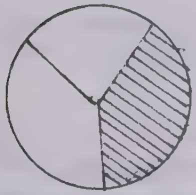
*8. $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{8}$ ____ ____ ____

*9. $\frac{1}{6}$ $\frac{2}{11}$ $\frac{4}{15}$ ____ ____ ____

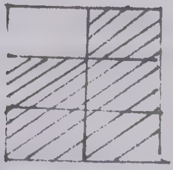
*10. $\frac{3}{5}$ $\frac{3}{4}$ $\frac{2}{3}$ ____ ____ ____

A. Write the fraction which is described below. Match the letter of each answer with the correct fraction at the bottom of the page to discover a wise old saying. The first one is done for you.

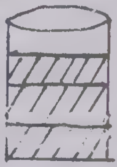
(E) $\frac{1}{3}$



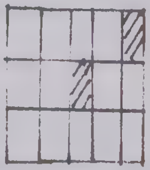
(L) ______



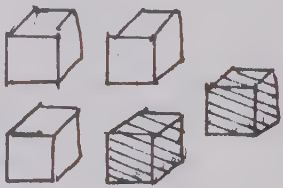
(D) ______



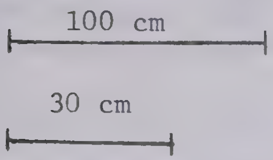
(S) ______



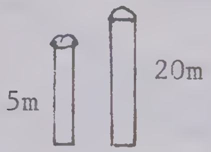
(W) ______



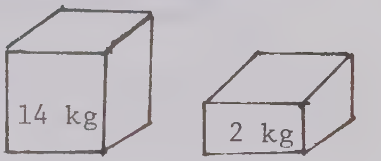
(I) ______



(M) $\frac{1}{4}$



(R) ______



(A) ______

Test
1. T ✓
2. F ✓
3. F ×
4. T ✓
5. T ×

(H) ______

$3\overline{)7}$

(Y) ______

3 candies
for 7 children

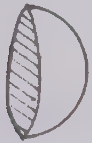
(C) ______

1 pencil cost
9 cents

(B) ______

$4\overline{)7}$

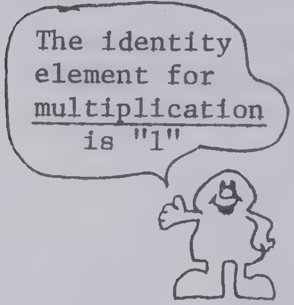
(O) ______

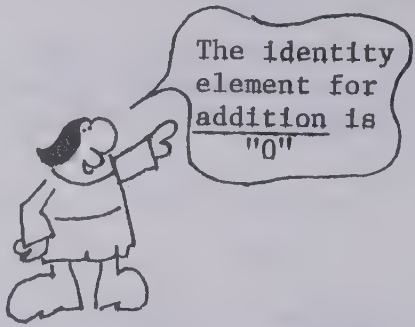


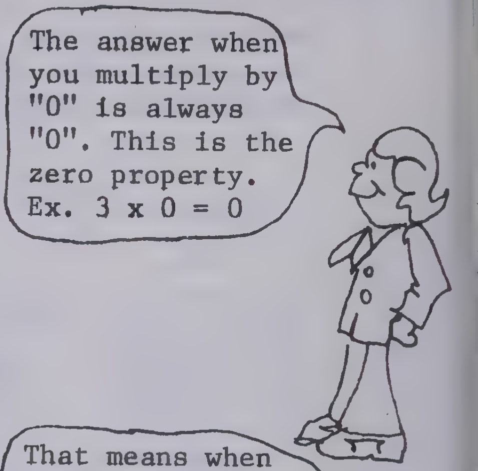
(T) ______

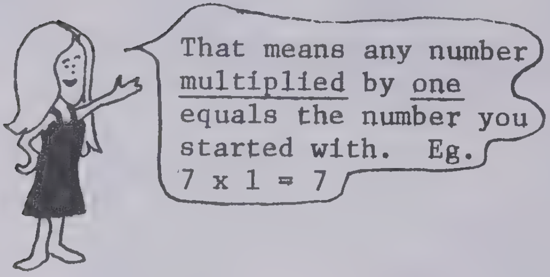
___ $\frac{1}{5}$ ___ $\frac{17}{3}$ E $\frac{1}{3}$ E $\frac{1}{3}$ ___ $\frac{3}{5}$ ___ $\frac{1}{7}$ ___ $\frac{5}{6}$ ___ $\frac{3}{7}$ ___ $\frac{7}{4}$ ___ $\frac{3}{10}$ ___ $\frac{1}{7}$ ___ $\frac{3}{4}$

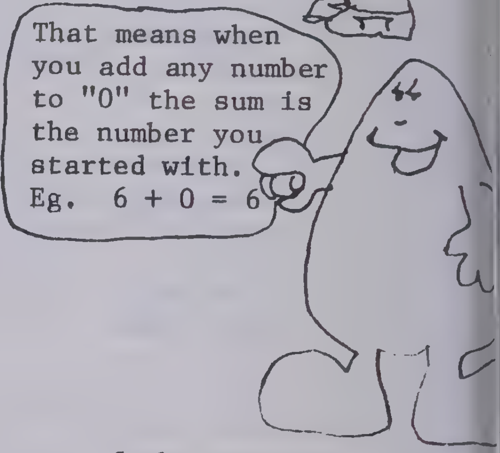
___ $\frac{1}{9}$ ___ $\frac{3}{5}$ ___ $\frac{1}{5}$ ___ $\frac{1}{9}$ ___ $\frac{17}{3}$ E $\frac{1}{3}$ ___ $\frac{2}{15}$ ___ $\frac{1}{5}$ ___ $\frac{17}{3}$ E $\frac{1}{3}$ ___ $\frac{2}{5}$ ___ $\frac{1}{2}$ ___ $\frac{1}{7}$ M $\frac{1}{4}$


The identity element for multiplication is "1"


The identity element for addition is "0"


The answer when you multiply by "0" is always "0". This is the zero property. Ex. 3 x 0 = 0


That means any number multiplied by one equals the number you started with. Eg. 7 x 1 = 7


That means when you add any number to "0" the sum is the number you started with. Eg. 6 + 0 = 6

Decode the following message by placing the letter of the correct answer in the appropriate blank.

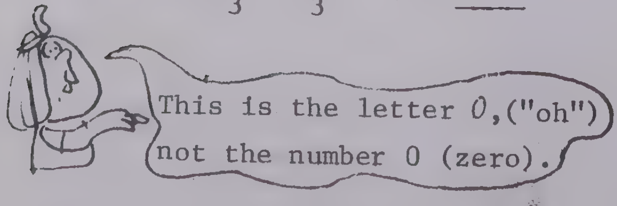
___ ___ ___   ___ ___ ___ ___ ___   ___ ___ ___ ___   ___ ___ ___ ___ ___ ___

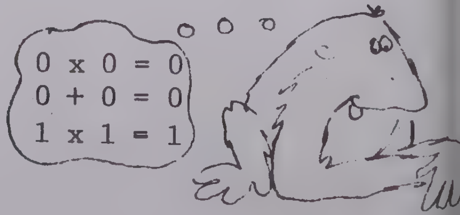
1 7 0 $\frac{6}{7}$ 14 1.5 0 $\frac{3}{7}$ 3 0 $\frac{3}{5}$ 1   0 $\frac{3}{4}$ $\frac{5}{6}$ 15 $\frac{8}{9}$ $\frac{3}{7}$

___ ___ ___ ___.

3 0 $\frac{3}{5}$ 1

1. $\frac{3}{5} \times 1 = r$ r = ____
2. $n + 0 = 7$ n = ____
3. $3 \times 1 = Z$ Z = ____
4. $\frac{6}{7} + 0 = t$ t = ____
5. $14 \times 1 = i$ i = ____
6. $m + 0 = 1.5$ m = ____
7. $O \times \frac{18}{3} = \frac{18}{3}$ O = ____
8. $\frac{3}{4} \times 1 = q$ q = ____
9. $8 + e = 8$ e = ____
10. $\frac{5}{6} + 0 = u$ u = ____
11. $15 \times 1 = a$ a = ____
12. $1 \times \frac{3}{7} = s$ s = ____
13. $\frac{8}{9} \times 1 = \ell$ ℓ = ____


This is the letter O,("oh") not the number 0 (zero).

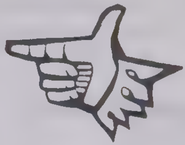


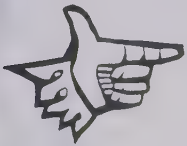
Example:

0 + 4 = 4 3¼ + 0 = 3¼

19 + 0 = 19 0 + 1 785 = 1 785

when zero is added to a number, the answer remains unchanged.





Example: 0 x 4 = 0 $\frac{4}{5}$ x 0 = 0

0 x 2.3 = 0 246 x 0 = 0

multiply by zero and the answer is also zero.

Example :

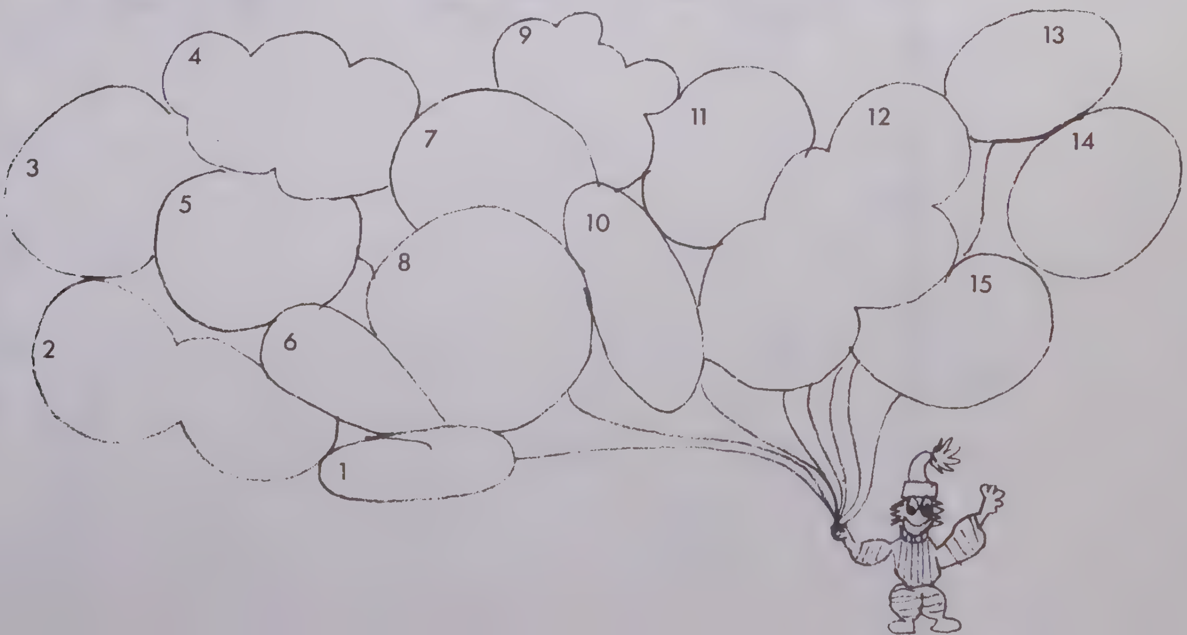
19 x 1 = 19 1 x 11 = 11

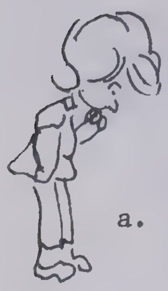
¼ x 1 = ¼ 1 x 6.21 = 6.21

when you multiply by one, the answer remains the same.

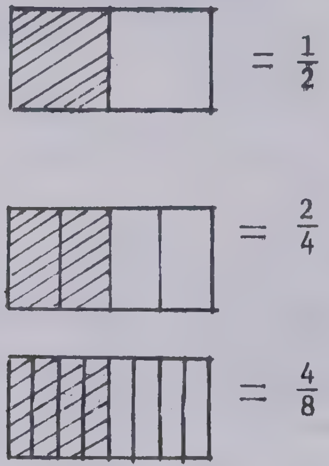
Fill in the balloons with your answers:

1. 1 x 6 = _____
2. 12 x 1 = _____
3. $\frac{2}{3}$ x 1 = _____
4. 1 x $7\frac{1}{2}$ = _______
5. 241.32 x 1 = ________
6. 0 + 8 = _____
7. $\frac{1}{2}$ + 0 = ______
8. $5\frac{1}{4}$ + 0 = ______
9. 0 + 92 = _____
10. 6.843 + 0 = ______
11. 0 x 2 = ______
12. $\frac{3}{5}$ x 0 = ______
13. 0 x $4\frac{1}{2}$ = _______
14. 121 x 0 = _____
15. 0 x 32.57 = ______

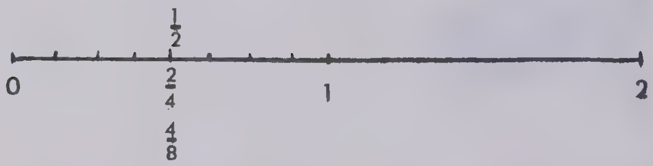



Say, there is more than one way to express the same amount.

a.



b.



One "sure way" to obtain an equivalent fraction is like this:

$$\frac{2}{4}\ \overset{\times 2}{\underset{\times 2}{=}}\ \frac{4}{8}$$

$$\frac{2}{4}\ \overset{\div 2}{\underset{\div 2}{=}}\ \frac{1}{2}$$

is another way you might be able to do it.

A. For each fraction below, find three equivalent fractions. The first one is done for you.

1. $\frac{5}{10} = \frac{5}{10}\ \overset{\times 2}{\underset{\times 2}{=}}\ \frac{10}{20}$, $\frac{5}{10}\ \overset{\div 5}{\underset{\div 5}{=}}\ \frac{1}{2}$, $\frac{5}{10}\ \overset{\times 3}{\underset{\times 3}{=}}\ \frac{15}{30}$

2. $\frac{8}{12}$

3. $\frac{9}{12}$

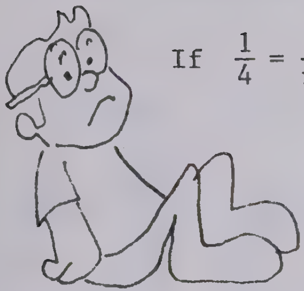
4. $\frac{10}{6}$

5. $\frac{3}{4}$

6. $\frac{5}{5}$

7. $\frac{3}{1}$

8. $\frac{7}{8}$



If $\frac{1}{4} = \frac{3}{m}$, how can I find the missing number?

Simple: $\frac{1}{4} \underset{\times 3}{\overset{\times 3}{=}} \frac{3}{12}$. So m = 12

How about something like

$\frac{10}{15} = \frac{m}{3}$?

$\frac{10}{15} \underset{\div 5}{\overset{\div 5}{=}} \frac{2}{3}$ So m = 2

B. The pairs of fractions below are equivalent. Find the missing number. The first one is done for you.

1. $\frac{1}{2} \underset{\times 4}{\overset{\times 4}{\longrightarrow}} \frac{m}{8}$ so $\frac{1}{2} = \frac{4}{8}$

2. $\frac{1}{4} = \frac{m}{8}$

3. $\frac{5}{6} = \frac{m}{12}$

4. $\frac{10}{12} = \frac{m}{6}$

5. $\frac{8}{10} = \frac{m}{5}$

6. $\frac{6}{5} = \frac{m}{15}$

CHARGE NOW, PAY LATER

Replace each letter with a natural number to make equivalent fractions. Decode the rectangle below by placing the corresponding letters to the number in the space above it.

$\frac{1}{2} = \frac{C}{8}$ C =

$\frac{3}{5} = \frac{U}{30}$ U =

$\frac{5}{6} = \frac{25}{T}$ T =

$\frac{3}{8} = \frac{O}{40}$ O =

$\frac{3}{4} = \frac{9}{D}$ D =

$\frac{7}{10} = \frac{49}{S}$ S =

$\frac{4}{5} = \frac{20}{R}$ R =

$\frac{7}{9} = \frac{A}{18}$ A =

$\frac{10}{11} = \frac{P}{44}$ P =

$\frac{1}{4} = \frac{9}{Y}$ Y =

$\frac{11}{15} = \frac{F}{30}$ F =

$\frac{1}{6} = \frac{10}{N}$ N =

$\frac{20}{40} = \frac{L}{20}$ L =

$\frac{10}{12} = \frac{E}{24}$ E =

$\frac{7}{10} = \frac{I}{60}$ I =

$\frac{11}{55} = \frac{H}{45}$ H =

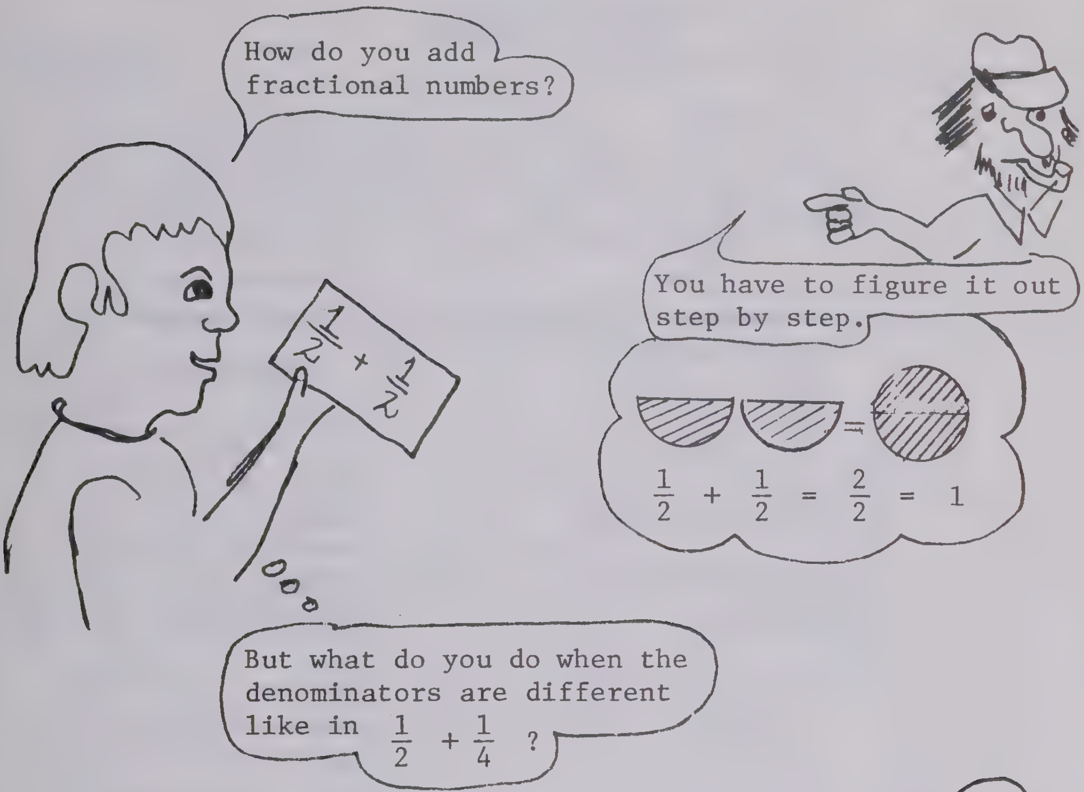
CLUE: Do Australian Kangaroos charge in shopping centres?

15 60 10 36   42 22   30 9 20 36

4 14 25 25 36   4 25 20 12 42 30

4 14 25 12 70   42 60

30 9 20 42 25   40 15 18 4 9 20 70

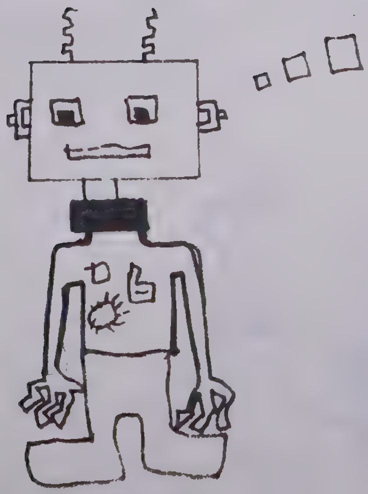

How do you add fractional numbers?
$\frac{1}{2} + \frac{1}{2}$
You have to figure it out step by step.
$\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$
But what do you do when the denominators are different like in $\frac{1}{2} + \frac{1}{4}$?

You have to find common denominators.

$$\frac{1}{2} = \frac{2}{4} \qquad \text{So} \quad \frac{1}{2} + \frac{1}{4}$$

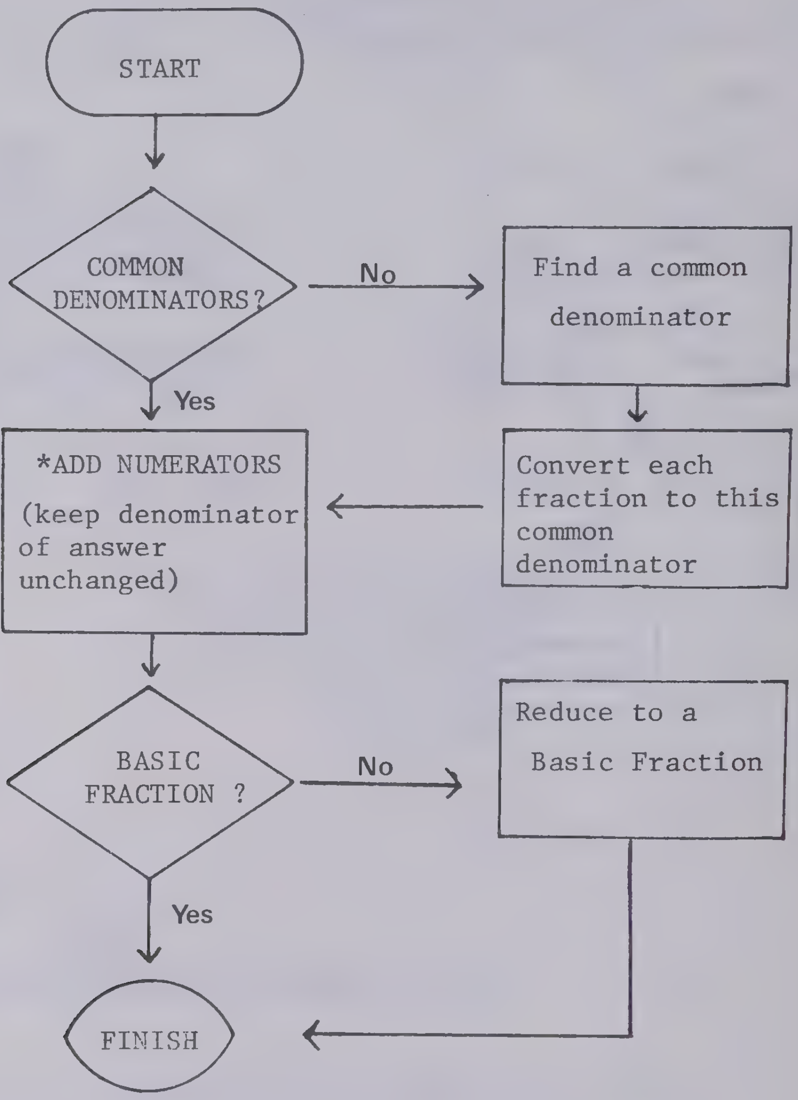
$$= \frac{2}{4} + \frac{1}{4}$$

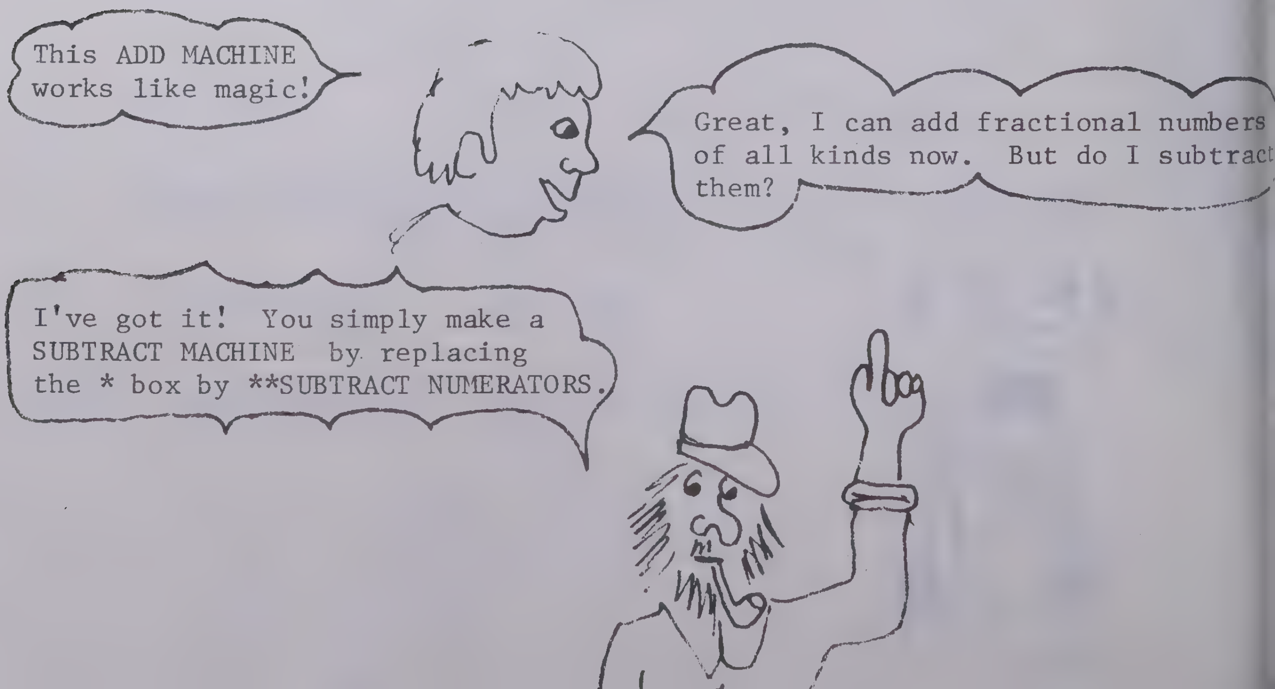
$$= \frac{3}{4}$$



I'd better draw up an ADD MACHINE
to make things easier

The Add Machine

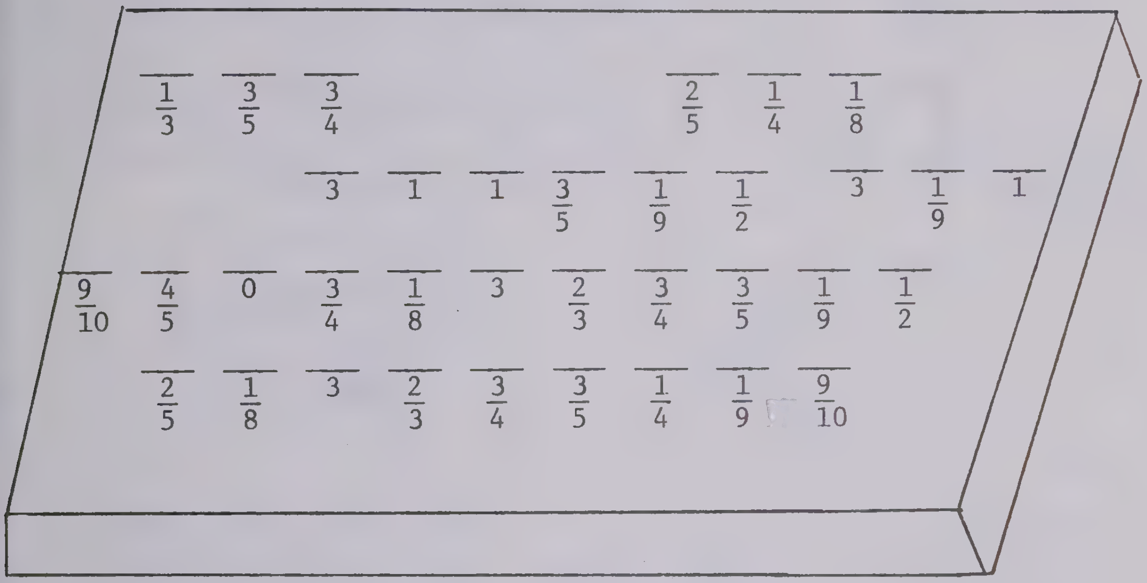

START
COMMON DENOMINATORS?
No
Find a common denominator
Yes
*ADD NUMERATORS (keep denominator of answer unchanged)
Convert each fraction to this common denominator
BASIC FRACTION ?
No
Reduce to a Basic Fraction
Yes
FINISH


This ADD MACHINE works like magic!
Great, I can add fractional numbers of all kinds now. But do I subtract them?
I've got it! You simply make a SUBTRACT MACHINE by replacing the * box by **SUBTRACT NUMERATORS.

Label the Box

To Decode:

1. Work each problem below.
2. Find the answer in the code.
3. Match the answer with the letter in the code.
4. Work until you know the label.


$\frac{1}{3}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{2}{5}$ $\frac{1}{4}$ $\frac{1}{8}$
3 1 1 $\frac{3}{5}$ $\frac{1}{9}$ $\frac{1}{2}$ 3 $\frac{1}{9}$ 1
$\frac{9}{10}$ $\frac{4}{5}$ 0 $\frac{3}{4}$ $\frac{1}{8}$ 3 $\frac{2}{3}$ $\frac{3}{4}$ $\frac{3}{5}$ $\frac{1}{9}$ $\frac{1}{2}$
$\frac{2}{5}$ $\frac{1}{8}$ 3 $\frac{2}{3}$ $\frac{3}{4}$ $\frac{3}{5}$ $\frac{1}{4}$ $\frac{1}{9}$ $\frac{9}{10}$

C = $\frac{1}{3} + \frac{1}{3}$ ○

F = $\frac{1}{10} + \frac{3}{10}$ ○

I = $\frac{1}{5} + \frac{2}{5}$ ○

S = $\frac{3}{5} + \frac{3}{10}$ ○

T = $\frac{1}{2} + \frac{1}{4}$ ○

U = $\frac{3}{5} + \frac{1}{5}$ ○

D = $\frac{9}{10} + \frac{1}{10}$ ○

K = $\frac{2}{3} - \frac{1}{3}$ ○

B = $\frac{3}{4} - \frac{3}{4}$ ○

O = $\frac{1}{2} - \frac{1}{4}$ ○

G = $\frac{5}{8} - \frac{1}{8}$ ○

R = $\frac{5}{8} - \frac{1}{2}$ ○

N = $\frac{4}{9} - \frac{1}{3}$ ○

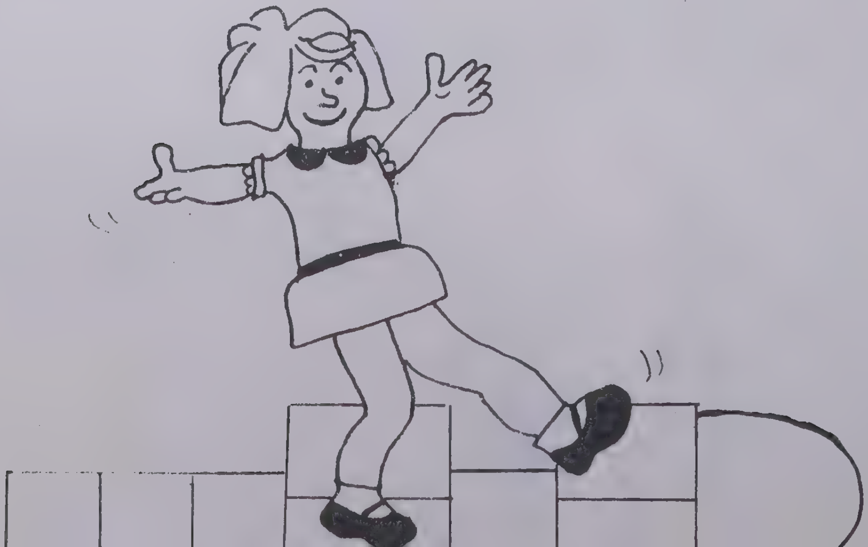
A = $\frac{5}{1} - \frac{2}{1}$ ○

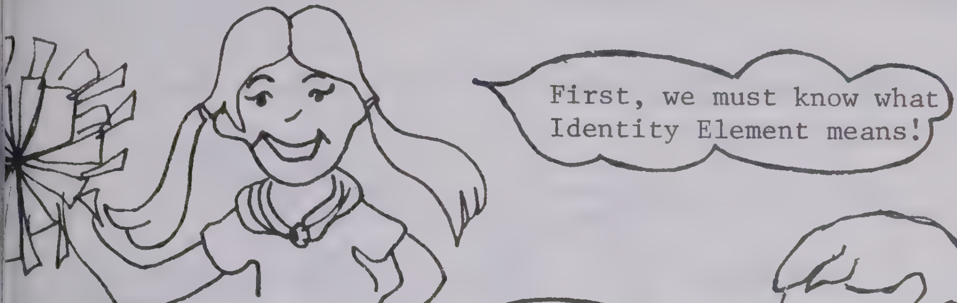
A. Add:

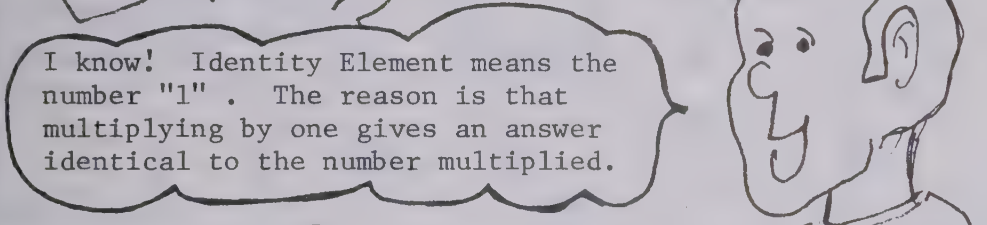
1. $\frac{1}{2} + \frac{1}{2} =$
2. $\frac{2}{4} + \frac{1}{4} =$
3. $\frac{3}{8} + \frac{3}{8} =$
4. $\frac{1}{10} + \frac{3}{10} =$
5. $\frac{3}{5} + \frac{2}{5} =$
6. $\frac{1}{2} + \frac{1}{4} =$
7. $\frac{5}{10} + \frac{1}{2} =$
8. $\frac{2}{9} + \frac{5}{9} =$
9. $\frac{7}{8} + \frac{3}{4} =$
10. $\frac{2}{3} + \frac{5}{6} =$
11. $\frac{2}{7} + \frac{1}{7} + \frac{3}{7} =$
12. $\frac{2}{3} + \frac{4}{12} + \frac{1}{6} =$

B. Subtract:

1. $\frac{4}{5} - \frac{3}{5} =$
2. $\frac{2}{4} - \frac{1}{4} =$
3. $\frac{1}{2} - \frac{1}{4} =$
4. $\frac{2}{3} - \frac{1}{6} =$
5. $\frac{10}{14} - \frac{3}{14} =$
6. $\frac{2}{11} - \frac{0}{11} =$
7. $\frac{8}{9} - \frac{1}{3} =$
8. $\frac{13}{4} - 1\frac{1}{8} =$
9. $\frac{3}{9} - \frac{1}{3} =$
10. $\frac{7}{10} - \frac{1}{2} =$




First, we must know what Identity Element means!


I know! Identity Element means the number "1". The reason is that multiplying by one gives an answer identical to the number multiplied.

Let's see an example.

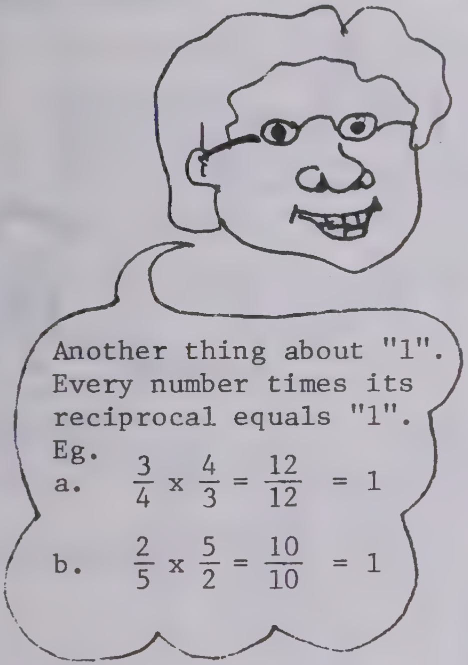
Fill in the blanks.

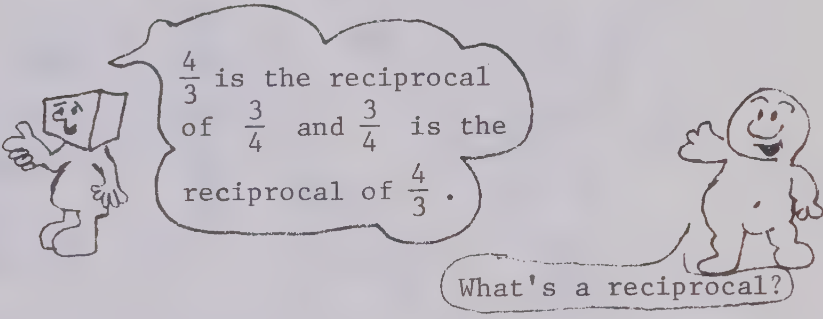
$1 \times 3 = 3$

$1 \times 8 = 8$

$1 \times \_\_\_ = 19$

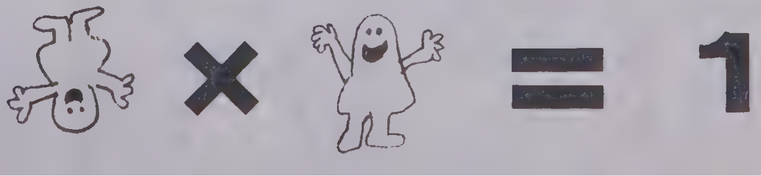
$1 \times 37 = \_\_\_$


Another thing about "1". Every number times its reciprocal equals "1".
Eg.
a. $\frac{3}{4} \times \frac{4}{3} = \frac{12}{12} = 1$
b. $\frac{2}{5} \times \frac{5}{2} = \frac{10}{10} = 1$

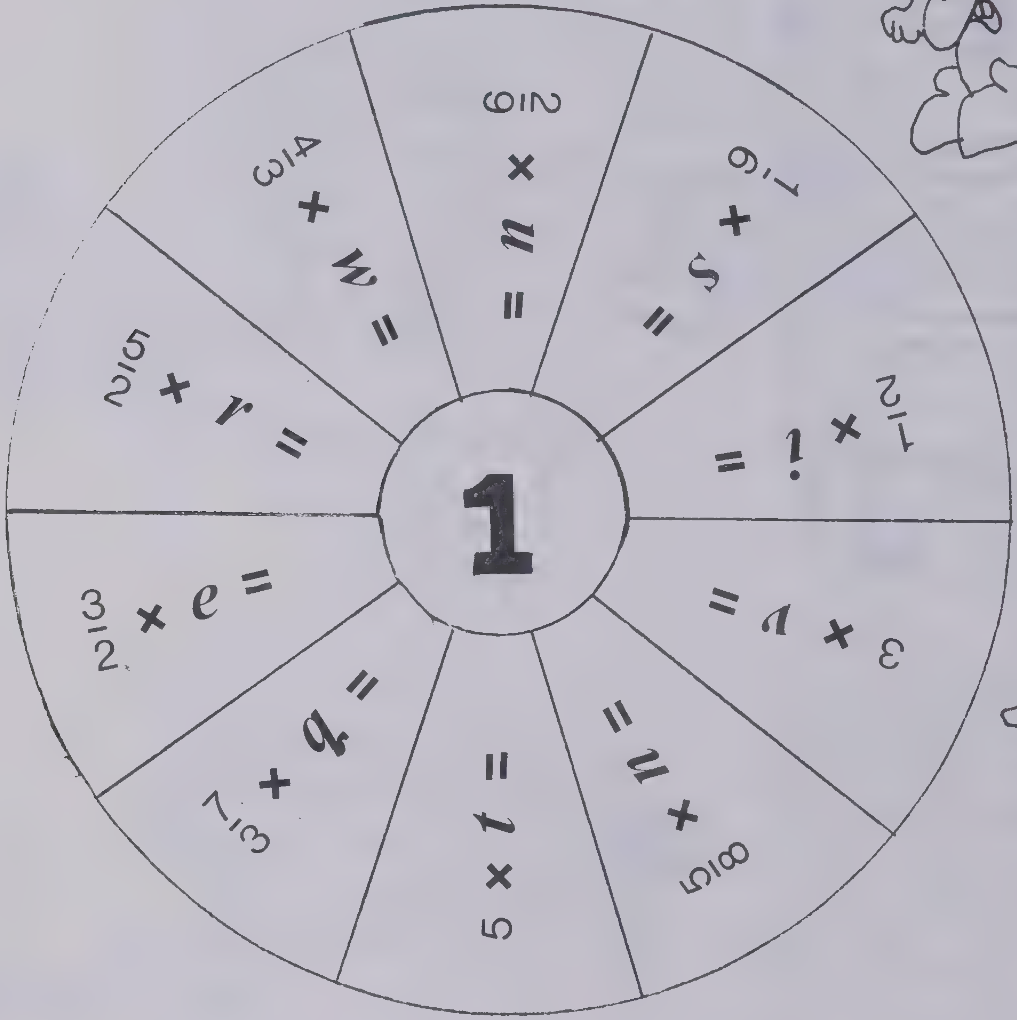

$\frac{4}{3}$ is the reciprocal of $\frac{3}{4}$ and $\frac{3}{4}$ is the reciprocal of $\frac{4}{3}$.
What's a reciprocal?

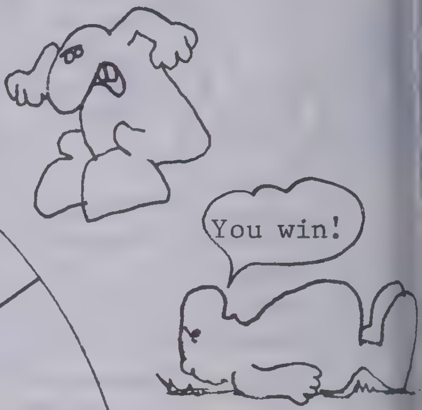
Fill in the following blanks:

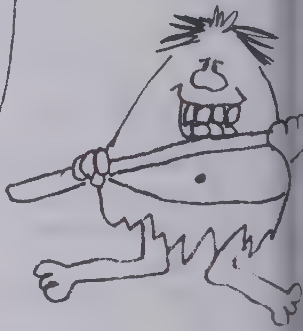
1. $\frac{5}{9} \times \_\_\_\_ = 1$
2. $\frac{2}{11} \times \_\_\_ = 1$
3. $\frac{9}{16} \times \frac{16}{9} = \_\_\_$
4. $\frac{1}{2} \times \_\_\_ = 1$
5. $\frac{3}{8} \times \_\_\_ = 1$
6. $\frac{5}{3} \times \_\_\_\_ = 1$
7. $\frac{4}{1} \times \_\_\_ = 1$
8. $\_\_\_ \times \frac{1}{5} = 1$
9. $\_\_\_ \times 2 = 1$
10. $1 \times \_\_\_\_ = 1$



Decode the following message by placing the correct letter above each reciprocal.







I never give

w

$\frac{3}{4}$ $\frac{2}{1}$ $\frac{8}{5}$ $\frac{8}{5}$ $\frac{2}{3}$ $\frac{2}{5}$ $\frac{6}{1}$ $\frac{8}{5}$ $\frac{2}{3}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{2}{5}$ $\frac{3}{7}$ $\frac{9}{2}$ $\frac{2}{1}$ $\frac{1}{5}$

w

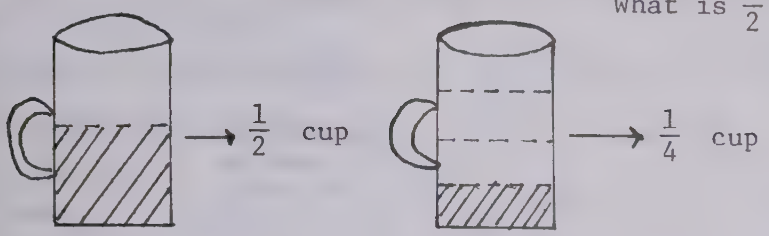
$\frac{3}{7}$ $\frac{9}{2}$ $\frac{2}{1}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{2}{3}$ $\frac{2}{5}$ $\frac{6}{1}$ $\frac{8}{5}$ $\frac{2}{3}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{2}{5}$ $\frac{3}{4}$ $\frac{2}{1}$ $\frac{8}{5}$

A. Multiplication:

"of" is the same as "times"

What is $\frac{1}{2}$ of $\frac{1}{2}$?

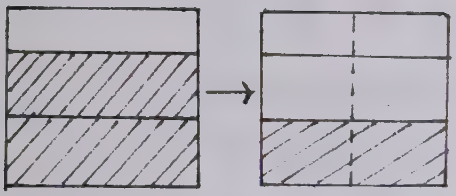
1.



$\frac{1}{2}$ of $\frac{1}{2}$ is $\frac{1}{4}$

$\frac{1}{2} \times \frac{1}{2} = \frac{1 \times 1}{2 \times 2} = \frac{1}{4}$

2.



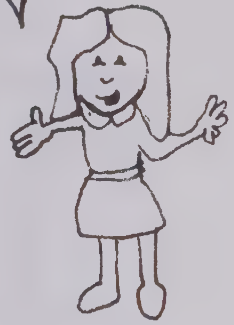
$\frac{2}{3}$ of a cup

$\frac{1}{3}$ of a cup

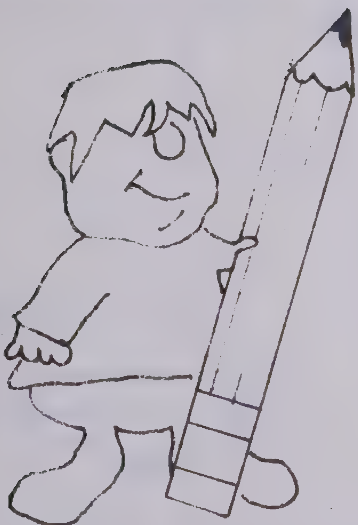
What is $\frac{1}{2}$ of $\frac{2}{3}$

$\frac{1}{2}$ of $\frac{2}{3} = \frac{1}{3}$

$\frac{1}{2} \times \frac{2}{3} = \frac{1\text{x}2}{2\text{x}3} = \frac{2}{6} = \frac{1}{3}$



3.



I got it!

$\frac{1}{2} \times \frac{2}{3} = \frac{1\text{x}2}{2\text{x}3} = \frac{2}{6} = \frac{1}{3}$

$\frac{2}{3} \times \frac{3}{5} = \frac{2\text{x}3}{3\text{x}5} = \frac{6}{15} = \frac{\square}{\square}$

Just multiply numerators
and multiply denominators

4. Multiply and reduce to basic fractions:

a. $\frac{1}{2} \times 4 = \frac{1}{2} \times \frac{4}{1} = \frac{\square}{\square}$

b. $\frac{4}{5} \times \frac{2}{3} = \frac{\square}{\square}$

c. $\frac{3}{7} \times \frac{2}{5} = \frac{\square}{\square}$

d. $3 \times \frac{4}{11} = \frac{\square}{\square}$

e. $\frac{9}{11} \times \frac{2}{5} = \frac{\square}{\square}$

f. $\frac{4}{9} \times 18 = \frac{\square}{\square} = \frac{\square}{\square}$

g. $\frac{2}{3} \times \frac{2}{3} = \frac{\square}{\square}$

h. $\frac{1}{2} \times \frac{1}{2} = \frac{\square}{\square}$

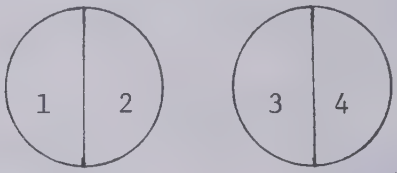
Hey these two are different!

i. $\frac{\quad}{7} \times \frac{3}{\quad} = \frac{15}{14}$

j. $\frac{\quad}{\quad} \times \frac{6}{7} = \frac{36}{49}$

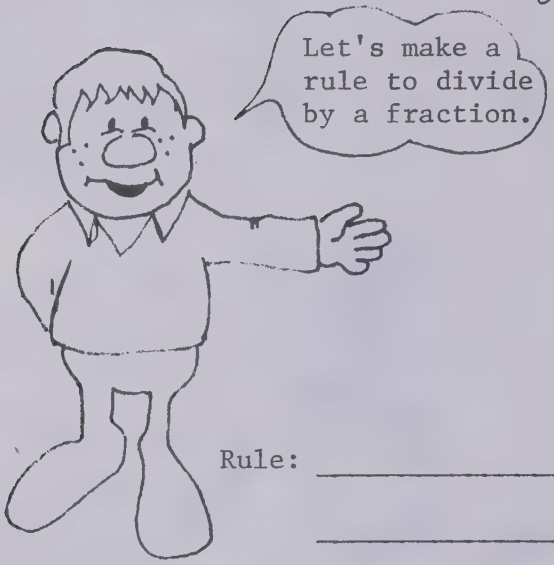
B. Division

1. How many half oranges in two whole oranges?



There are $2 \div \frac{1}{2} = 4$ half oranges. But that is the same as $2 \times \frac{2}{1} = 4$

2.


Let's make a rule to divide by a fraction.

Division:

a. $3 \div \frac{1}{4} = 12$

b. $\frac{2}{3} \div \frac{1}{6} = \frac{12}{3} = \frac{4}{1}$

Multiplication:

a. $3 \times \frac{4}{1} = \frac{12}{1}$

b. $\frac{2}{3} \times \frac{6}{1} = \frac{12}{3} = \frac{4}{1}$

Rule: ______________________________

____

3. Divide each of the following:

a. $\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \times \frac{3}{1} = \frac{1 \times 3}{2 \times 1} = \frac{3}{2} = 1\frac{1}{2}$

b. $\frac{2}{3} \div \frac{3}{5} =$ ______________________

c. $\frac{4}{9} \div \frac{\square}{\square} = \frac{4}{9} \times \frac{5}{7} = \frac{\square}{\square}$

d. $2 \div \frac{3}{4} = \frac{2}{1} \times \frac{4}{3} = \frac{8}{3}$

e. $\frac{3}{4} \div 2 = \frac{3}{4} \div \frac{2}{\square} = \frac{3}{4} \times \frac{\square}{2} = \frac{\square}{\square}$

f. $\frac{8}{11} \div \frac{9}{3} = \frac{8}{11} \times \frac{\square}{\square} = \frac{\square}{\square}$

g. $\frac{14}{25} \div 3 = \frac{14}{25} \times \frac{\square}{\square} = \frac{\square}{\square}$

h. $3 \div \frac{3}{8} = \frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$

i. $2\frac{1}{2} \div 3\frac{3}{4} = \frac{5}{2} \div \frac{15}{4} = \frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$

j. $9\frac{3}{4} \div 2\frac{5}{8} = \frac{39}{\square} \div \frac{\square}{8} = \frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$

Boy, this was a lot of inverting work!

LET'S PLAY BINGO

First: Do any question.

Second: Find the answer in the bingo card and cross out the space.

Third: Keep working until you find a bingo.

$\frac{2}{25}$	$\frac{1}{16}$	$\frac{2}{5}$	$\frac{1}{12}$	$\frac{1}{20}$
$\frac{3}{10}$	$\frac{4}{15}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{3}$
$\frac{9}{16}$	1	6	2	$\frac{7}{10}$
$\frac{3}{5}$	$\frac{4}{5}$	$\frac{2}{3}$	12	$\frac{7}{10}$
$\frac{5}{8}$	$\frac{1}{9}$	$\frac{1}{2}$	3	$\frac{1}{5}$

$\frac{1}{10} \times \frac{1}{2}$

$\frac{1}{5} \div \frac{1}{5}$

$\frac{1}{5} \times 1$

$\frac{1}{2} \times \frac{1}{2}$

$\frac{1}{4} \div 3$

$\frac{1}{4} \times \frac{1}{2}$

$\frac{1}{5} \times \frac{2}{5}$

$\frac{1}{8} \div \frac{1}{3}$

$\frac{3}{10} \div \frac{1}{10}$

$6 \div \frac{1}{2}$

$\frac{2}{3} \div \frac{1}{3}$

$5 \times \frac{1}{8}$

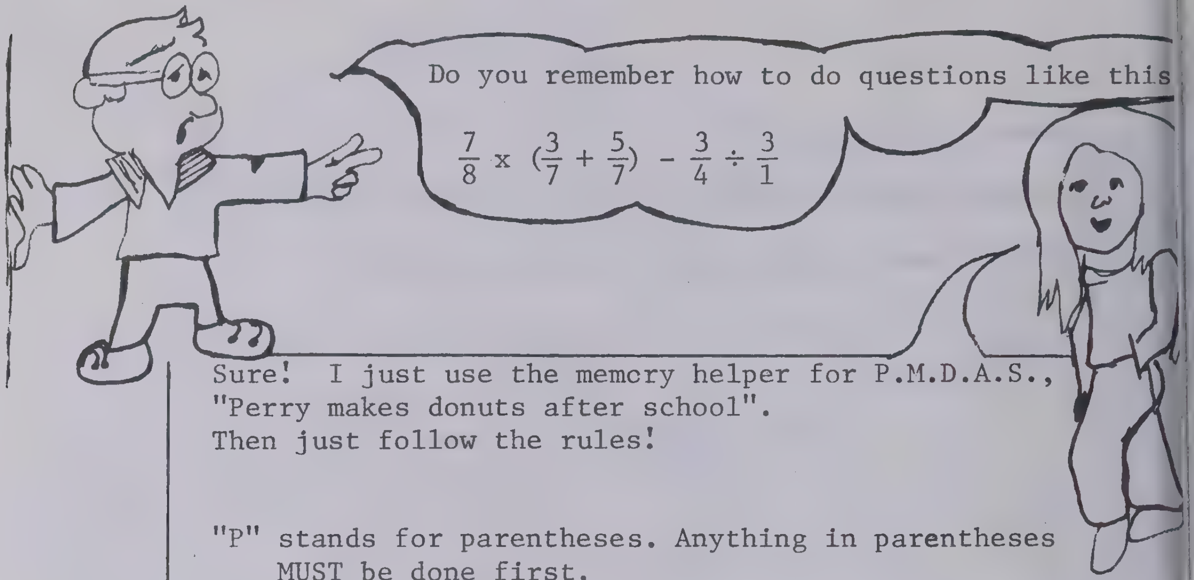
$\frac{1}{5} \times 3$

$\frac{1}{10} \div \frac{1}{3}$

$\frac{1}{3} \div \frac{1}{2}$

$\frac{1}{3} \times \frac{1}{3}$

$4 \times \frac{1}{5}$


Do you remember how to do questions like this
$\frac{7}{8} \times (\frac{3}{7} + \frac{5}{7}) - \frac{3}{4} \div \frac{3}{1}$

Sure! I just use the memory helper for P.M.D.A.S.,
"Perry makes donuts after school".
Then just follow the rules!

"P" stands for parentheses. Anything in parentheses MUST be done first.

"M" and the "D" stand for multiply and divide. These are to be done NEXT, from left to right.

The "A" and the "S" stand for add and subtract. These are done LAST, also from left to right.

Example: $\frac{7}{8} \times (\underbrace{\frac{3}{7} + \frac{5}{7}}) - \frac{3}{4} \div \frac{3}{1}$

Parentheses: $\frac{7}{8} \times (\frac{8}{7}) - \frac{3}{4} \div \frac{3}{1}$

Multiply and Divide $\underbrace{\frac{7}{8} \times \frac{8}{7}}_{1} - \underbrace{\frac{3}{4} \div \frac{3}{1}}_{\frac{1}{4}}$

$1 - \frac{1}{4}$

Add and Subtract $1 - \frac{1}{4} = \boxed{\frac{3}{4}}$

Try to do these examples by yourself, but DON'T FORGET: Parentheses - FIRS
Multiply & Divide - NEXT
Add and Subtract - LAST

a. $\frac{3}{4} + \frac{4}{5} \times \frac{1}{4}$

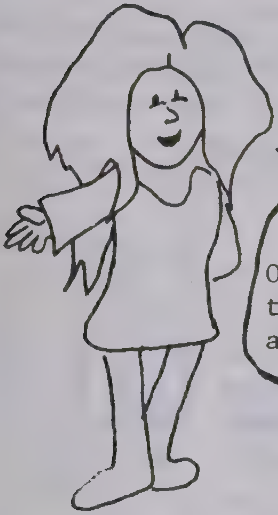
$\frac{3}{4} + \frac{1}{5} = \frac{19}{20}$

b. $\frac{5}{6} \times (\frac{3}{4} - \frac{1}{4}) + \frac{1}{3}$

c. $\frac{4}{5} - \frac{2}{3} + \frac{1}{6} \times \frac{2}{5}$

d. $\frac{7}{8} \times \frac{3}{7} \div \frac{1}{2} \times \frac{3}{4}$

e. $\frac{5}{6} \div \frac{3}{2} - (\frac{1}{3} + \frac{1}{6})$



Do you remember how we find out if two fractions are equivalent?

Of course! All we do is find their cross-products. Look at the example.

Example: $\frac{3}{5} \times \frac{6}{10}$

$10 \times 3 = 30$

$5 \times 6 = 30$

Since the cross-products are the same (30), then $\frac{3}{5} = \frac{6}{10}$

But what happens if the cross-products are not equal.

Then the two fractions are not equivalent! One of the fractions must be "greater than" (>) or "less than" (<) the other.

Don't forget that you must write the cross-product near the numerator of each fraction.

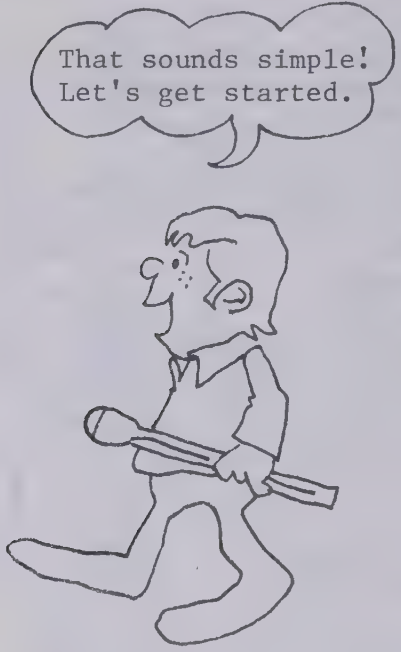
Example:

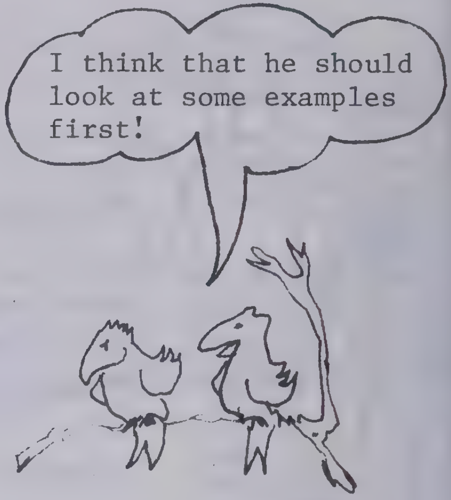
$4 \times 2 = 8$ $5 \times 3 = 15$

$\frac{2}{5} \times \frac{3}{4}$

Since 8 "is less than" 15,

then $\frac{2}{5} < \frac{3}{4}$


That sounds simple! Let's get started.


I think that he should look at some examples first!

Examples:

$2 \times 3 = 6$ $5 \times 1 = 5$

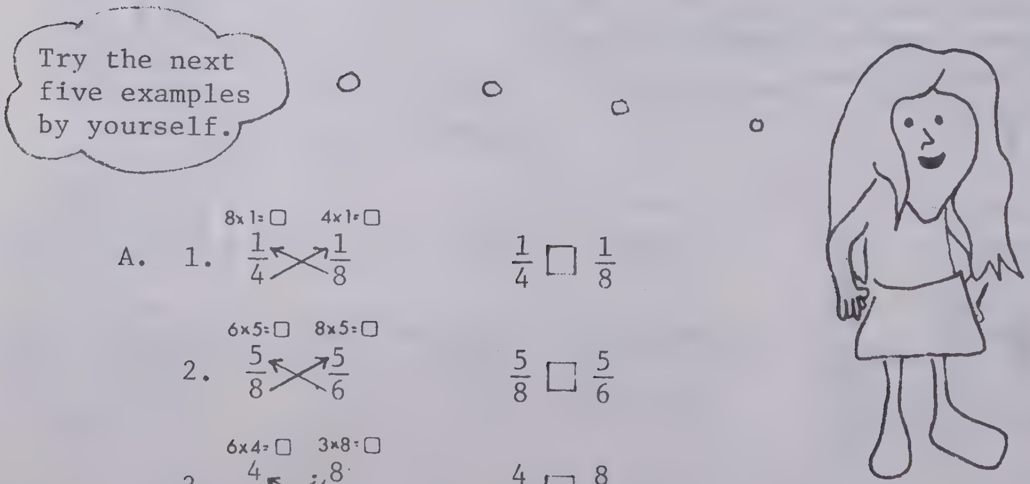
$\frac{3}{5} \quad \frac{1}{2}$ Since 6 > 5, then $\frac{3}{5} \boxed{>} \frac{1}{2}$

$14 \times 2 = 28$ $7 \times 4 = 28$

$\frac{2}{7} \quad \frac{4}{14}$ Since 28 = 28, then $\frac{2}{7} \boxed{=} \frac{4}{14}$

$3 \times 8 = 24$ $4 \times 7 = 28$

$\frac{3}{4} \quad \frac{7}{8}$ Since 24 < 28, then $\frac{3}{4} \boxed{<} \frac{7}{8}$


Try the next five examples by yourself.

A. 1. $8 \times 1 = \square$ $4 \times 1 = \square$

$\frac{1}{4} \quad \frac{1}{8}$ $\frac{1}{4} \square \frac{1}{8}$

2. $6 \times 5 = \square$ $8 \times 5 = \square$

$\frac{5}{8} \quad \frac{5}{6}$ $\frac{5}{8} \square \frac{5}{6}$

3. $6 \times 4 = \square$ $3 \times 8 = \square$

$\frac{4}{3} \quad \frac{8}{6}$ $\frac{4}{3} \square \frac{8}{6}$

4. $\square$ $\square$

$\frac{6}{7} \quad \frac{7}{9}$ $\frac{6}{7} \square \frac{7}{9}$

5. $\square$ $\square$

$\frac{5}{9} \quad \frac{7}{10}$ $\frac{5}{9} \square \frac{7}{10}$

B. Place the sign (<, >, =) in the box to show that the first fraction is "less than", "greater than" or "equivalent to" the second fraction.

1. $\frac{3}{4} \square \frac{4}{5}$

2. $\frac{5}{12} \square \frac{3}{8}$

3. $\frac{5}{3} \square \frac{10}{6}$

4. $\frac{4}{9} \square \frac{5}{10}$

5. $\frac{4}{10} \square \frac{3}{8}$

6. $\frac{9}{3} \square \frac{6}{2}$

7. $\frac{5}{4} \square \frac{9}{8}$

8. $\frac{5}{2} \square \frac{15}{6}$

9. $\frac{2}{3} \square \frac{5}{6}$

10. $\frac{1}{4} \square \frac{1}{3}$

C.

But how do I compare three fractions?
Simple! Use the same method as you would for two fractions. Follow this example:

Example: $\frac{3}{4}, \frac{2}{3}, \frac{5}{6}$

First compare $\overset{\boxed{9}}{\frac{3}{4}}$ and $\overset{\boxed{8}}{\frac{2}{3}}$

so $\frac{3}{4} > \frac{2}{3}$

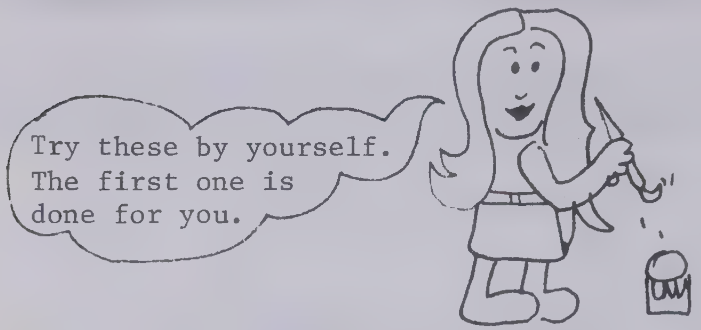
Now compare $\overset{\boxed{12}}{\frac{2}{3}}$ and $\overset{\boxed{15}}{\frac{5}{6}}$

so $\frac{2}{3} < \frac{5}{6}$

or $\frac{5}{6} < \frac{2}{3}$

Great. All I found out is that since $\frac{3}{4} > \frac{2}{3}$, and $\frac{5}{6} > \frac{2}{3}$, then $\frac{2}{3}$ must be the smallest fraction. But which is the largest?

I've got it. I know that $\frac{2}{3}$ is the smallest fraction. All I have to do is compare $\frac{3}{4}$ and $\frac{5}{6}$ to find the largest! Let's see, 6 x 3 = 18, and 4 x 5 = 20 so $\frac{5}{6}$ is the largest fraction. The three fractions from smallest to largest would be $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$


Try these by yourself. The first one is done for you.

Write these fractions from smallest to largest.

1. $\frac{4}{5}, \frac{5}{7}, \frac{5}{9}$

$$\overset{28}{\frac{4}{5}} \times \overset{25}{\frac{5}{7}} \qquad \overset{45}{\frac{5}{7}} \times \overset{35}{\frac{5}{9}} \qquad \overset{36}{\frac{4}{5}} \times \overset{25}{\frac{5}{9}}$$

$$\frac{4}{5} > \frac{5}{7} \qquad \frac{5}{7} > \frac{5}{9} \qquad \frac{4}{5} > \frac{5}{9}$$

$\frac{4}{5}$ is greater than $\frac{5}{7}$ and $\frac{5}{9}$ so it must be the largest.

$\underline{\frac{5}{9}}, \underline{\frac{5}{7}}, \underline{\frac{4}{5}}$

2. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ ________, ______, ______

3. $\frac{3}{8}, \frac{1}{4}, \frac{2}{5}$ ________, _______, ________

4. $\frac{3}{10}, \frac{4}{11}, \frac{5}{12}$ ______, ________, ______

5. $\frac{3}{2}, \frac{8}{5}, \frac{4}{3}$ _______, _______, ________

A. Remember the *place value* of the digits in a number.

Example 1: 643 means there are 6 one hundreds
4 tens
3 ones

instead of writing this information in words, use symbols:

$$643 = (6 \times 100) + (5 \times 10) + (3 \times 1)$$

Example 2: 0.451 means there are 4 one tenths
5 one hundredths
1 one thousandth

in symbols:

$$0.451 = (4 \times \frac{1}{10}) + (5 \times \frac{1}{100}) + (1 \times \frac{1}{1\ 000})$$

B. Short cut:

1. list the numbers of the decimal, leaving spaces.
2. put in a multiply sign after each number.
3. list the fractions $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1\ 000}$ etc. in order in the spaces.

   Put parentheses around each group.
4. separate each group by putting in an addition sign.
5. multiply each group.

Example: Write 0.601 in expanded form:

1. 6 0 1
2. 6 x 0 x 1 x
3. $(6 \times \frac{1}{10})$ $(0 \times \frac{1}{100})$ $(1 \times \frac{1}{1\ 000})$
4. $(6 \times \frac{1}{10}) + (0 \times \frac{1}{100}) + (1 \times \frac{1}{1\ 000})$
5. $\frac{6}{10} + \frac{0}{100} + \frac{1}{1\ 000}$

Examples:

a. $0.05 = \frac{0}{10} + \frac{5}{100}$

b. $0.6 = \frac{6}{10}$

c. $0.8045 = \frac{8}{10} + \frac{0}{100} + \frac{4}{1\ 000} + \frac{5}{10\ 000}$

d. $0.001 = \frac{0}{10} + \frac{0}{100} + \frac{1}{1\ 000}$

How are a bug and a cactus the same?

INSTRUCTIONS: Match up the decimal numeral on the left hand side with the proper expanded form. Beside each decimal numeral the is a letter and beside each expanded form there is a numbe When you have completed matching, place the letter in the above the appropriate number in the decoding key.

N: 0.6	1: $\frac{1}{10} + \frac{1}{100} + \frac{5}{1\ 000}$
L: 0.402	2: $\frac{4}{10} + \frac{6}{100} + \frac{2}{1\ 000}$
B: 0.845	3: $\frac{0}{10} + \frac{0}{100} + \frac{2}{1\ 000} + \frac{1}{10\ 000}$
H: 0.03	4: $\frac{8}{10} + \frac{9}{100}$
O: 0.115	5: $\frac{7}{10}$
A: 0.4206	6: $\frac{4}{10} + \frac{0}{100} + \frac{2}{1\ 000}$
R: 0.89	7: $\frac{0}{10} + \frac{6}{100}$
D: 0.007	8: $\frac{6}{10}$
S: 0.462	9: $\frac{8}{10} + \frac{4}{100} + \frac{5}{1\ 000}$
C: 0.935	10: $\frac{8}{10} + \frac{6}{100} + \frac{1}{1\ 000}$
G: 0.0021	11: $\frac{9}{10} + \frac{3}{100} + \frac{5}{1\ 000}$
Y: 0.7	12: $\frac{4}{10} + \frac{2}{100} + \frac{0}{1\ 000} + \frac{6}{10\ 000}$
E: 0.90	13: $\frac{0}{10} + \frac{3}{100}$
U : 0.861	14: $\frac{9}{10} + \frac{0}{100}$
T: 0.06	15: $\frac{0}{10} + \frac{0}{100} + \frac{7}{1\ 000}$

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
12 9 10 3 9 1 7 13 14 4 2 5 1 10 12 8 15

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
12 11 12 11 7 10 2 8 14 14 15 6 14 2 5 1 10

What is green, has two legs, and a trunk?

Directions: Find each of the fractions in their decimal form in the boxes below. Draw a circle around the letter in the box. When you have drawn 15 circles, place the letters in the blanks below in order from left to right. The first one is done for you.

$\frac{5}{10} + \frac{6}{100} = 0.56$

$\frac{0}{10} + \frac{2}{100} + \frac{1}{1\ 000}$

$\frac{4}{10} + \frac{3}{100} + \frac{5}{1\ 000}$

$\frac{9}{10} + \frac{2}{100} + \frac{1}{1\ 000}$

$\frac{3}{10}$

$\frac{0}{10} + \frac{3}{100}$

$\frac{1}{10} + \frac{4}{100} + \frac{1}{1\ 000}$

$\frac{2}{10} + \frac{7}{100}$

$\frac{9}{10} + \frac{3}{100}$

$\frac{0}{10} + \frac{0}{100} + \frac{5}{1\ 000} + \frac{6}{10\ 000}$

$\frac{8}{10} + \frac{7}{100} + \frac{2}{1\ 000}$

$\frac{1}{10} + \frac{9}{100} + \frac{0}{1\ 000} + \frac{2}{10\ 000}$

$\frac{5}{10} + \frac{9}{100}$

$\frac{0}{10} + \frac{0}{100} + \frac{3}{1\ 000}$

$\frac{5}{10} + \frac{2}{100} + \frac{9}{1\ 000}$

B 0.027				
D 0.0003	Ⓐ 0.56	S 0.27	E 0.872	F 0.0141
A 0.003	S 0.03	A 0.0021	I 0.921	G 0.093
C 0.3	H 0.85	K 0.0056	C 0.041	T 0.59
O 0.435	I 0.21	U 0.93	J 0.52	R 0.851
R 0.141	I 0.021	U 0.529	S 0.1902	T 0.529

A ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

A. Remember the *place values* of digits in a number.

$\frac{1}{10}$ - first column to the right of the decimal point.

$\frac{1}{100}$ - second column to the right of the decimal point.

$\frac{1}{1\ 000}$ - ______________________________

Example 1: $\frac{8}{10} = 0.8$ because $\frac{1}{10}$ is the first column to the right of the decimal point.

Example 2: $\frac{0}{10} + \frac{8}{100} + \frac{7}{1\ 000} = 0.087$ because there are 0 one-tenths
8 one hundred
7 one thousan

B. Short cut:

1. place a decimal point on your page.
2. list the numbers in order as they appear in expanded form
   - if a place value is left out of the expanded form, you MUST put a zero in the decimal number. (See example c)
   - whole numbers are written to the left of the decimal (See example d).

Examples. Write as decimal numbers

a. $\frac{5}{10} + \frac{1}{100} = 0.51$

b. $\frac{0}{10} + \frac{0}{100} + \frac{1}{1\ 000} = 0.001$

c. $\frac{4}{10} + \frac{3}{1\ 000} = 0.403$ *(Note: the $\frac{1}{100}$ was left out.)*

d. $5 + \frac{3}{10} + \frac{2}{100} = 5.32$

What is too much for one, enough for two, but nothing to three?

Instructions:

Match the questions on the left with the correct answers on the right. Place the letters that correspond to the numbers in the decoding key in the appropriate space. (Not all the letters are used).

1. $\frac{5}{10} + \frac{0}{100} + \frac{3}{1\,000}$
2. $\frac{0}{10} + \frac{5}{100} + \frac{5}{1\,000}$
3. $\frac{4}{10}$
4. $\frac{8}{10} + \frac{7}{100}$
5. $\frac{0}{10} + \frac{0}{100} + \frac{6}{1\,000}$
6. $\frac{4}{10} + \frac{1}{100}$

S: 0.187

E: 0.41

B: 0.55

R: 0.503

K: 0.807

C: 0.4

T: 0.055

R: 0.06

S: 0.87

A: 0.006

DECODING KEY:

$\overline{\ 5\ }$ $\qquad$ $\overline{\ 4\ }$ $\overline{\ 6\ }$ $\overline{\ 3\ }$ $\overline{\ 7\ }$ $\overline{\ 6\ }$ $\overline{\ 2\ }$

REVIEW EXERCISES: UNIT III

1. Write each of the following in expanded form.

a. 0.869

b. 0.402

c. 0.31

d. 0.423

e. 0.006

f. 0.320 1

g. 0.5

h. 0.034

i. 0.560

j. 0.802

k. 0.92

2. Write each of the following as decimals.

a. $\frac{0}{10} + \frac{8}{100} =$

b. $\frac{9}{10} + \frac{5}{100} =$

c. $\frac{7}{10} =$

d. $\frac{1}{10} + \frac{0}{100} + \frac{6}{1\ 000} =$

e. $\frac{2}{10} + \frac{2}{100} + \frac{2}{1\ 000} =$

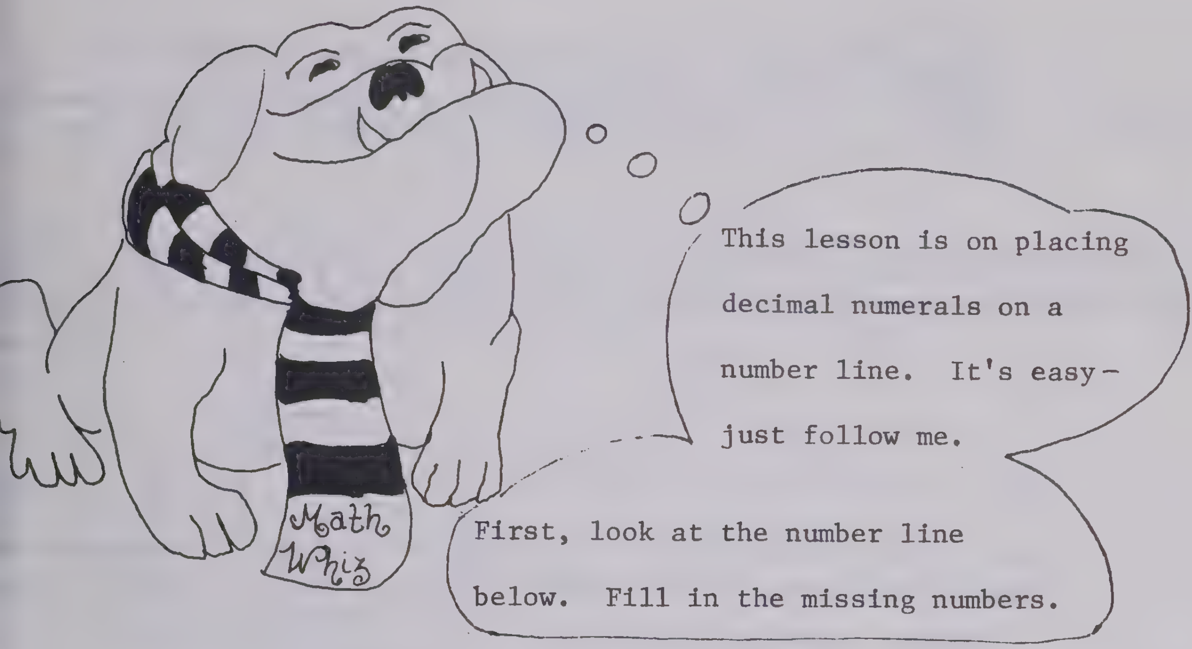
f. $\frac{2}{10} + \frac{0}{100} =$

g. $\frac{5}{10} + \frac{9}{100} + \frac{6}{1\ 000} =$

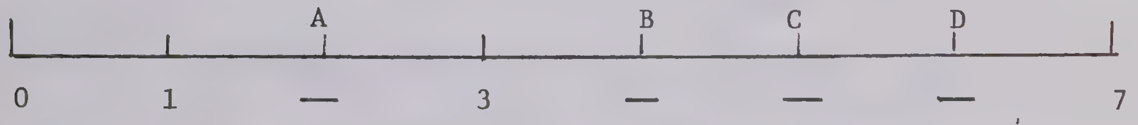
h. $\frac{0}{10} + \frac{2}{100} =$

i. $\frac{9}{10} + \frac{8}{100} =$

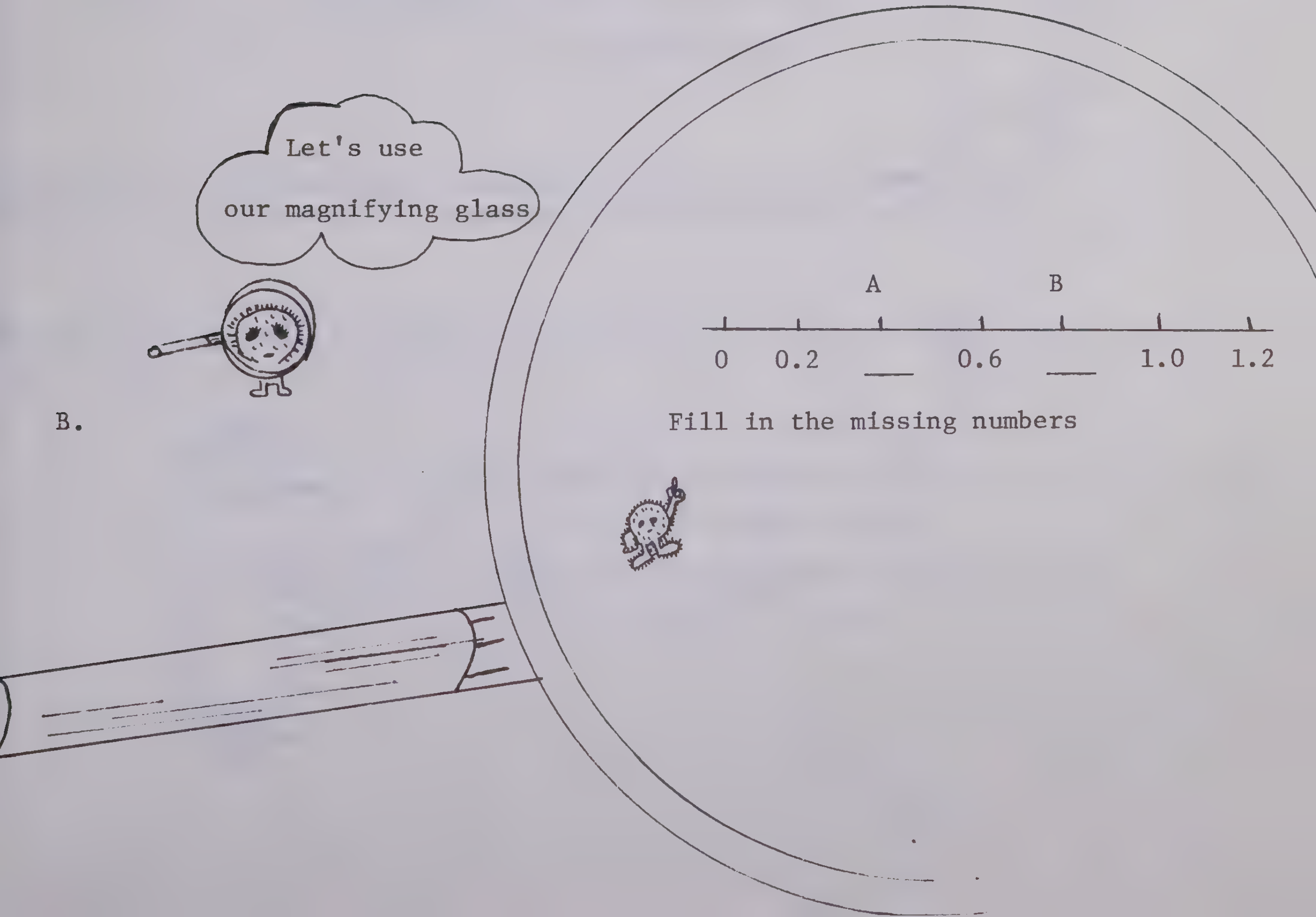
j. $\frac{6}{10} + \frac{0}{100} + \frac{3}{1\ 000} =$


This lesson is on placing decimal numerals on a number line. It's easy - just follow me.
First, look at the number line below. Fill in the missing numbers.
Math Whiz

A.

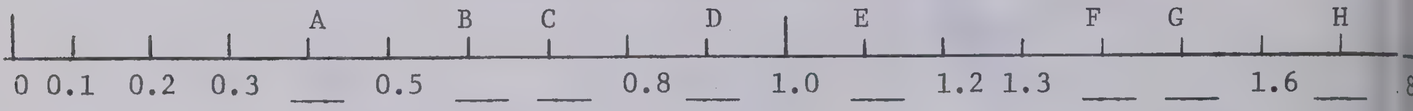


B.

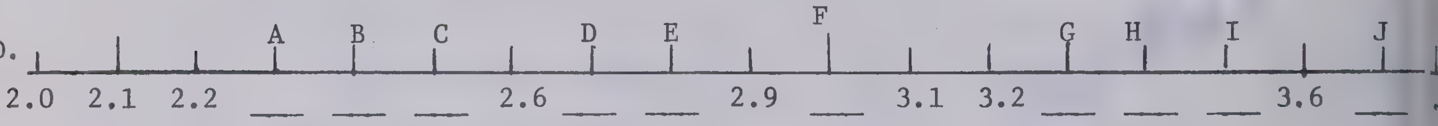

Let's use our magnifying glass
A
B
0
0.2
___
0.6
___
1.0
1.2

Fill in the missing numbers

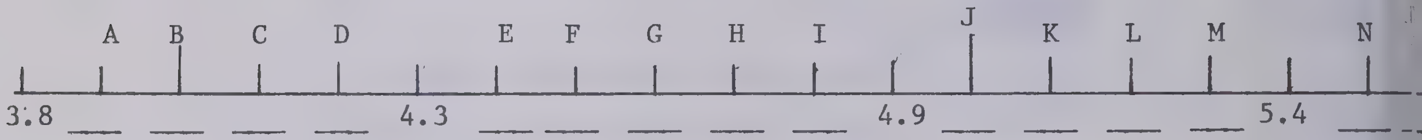
C.

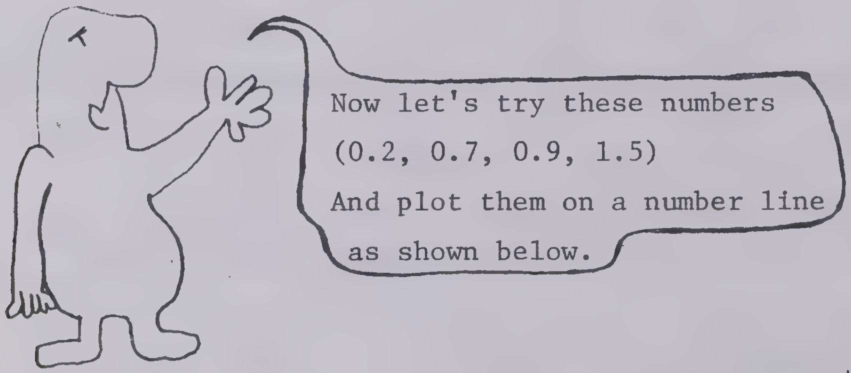

A B C D E F G H
0 0.1 0.2 0.3 ___ 0.5 ___ ___ 0.8 ___ 1.0 ___ 1.2 1.3 ___ ___ 1.6 ___

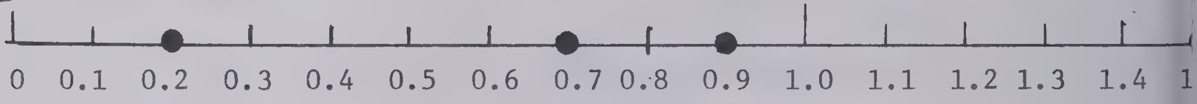
D.


A B C D E F G H I J
2.0 2.1 2.2 ___ ___ ___ 2.6 ___ ___ 2.9 ___ 3.1 3.2 ___ ___ ___ 3.6 ___

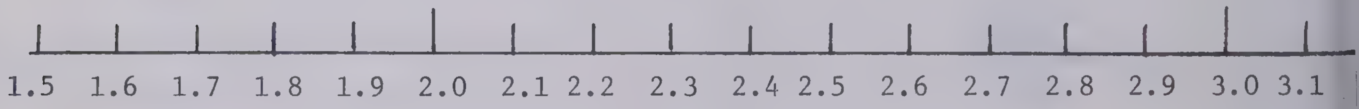
E.

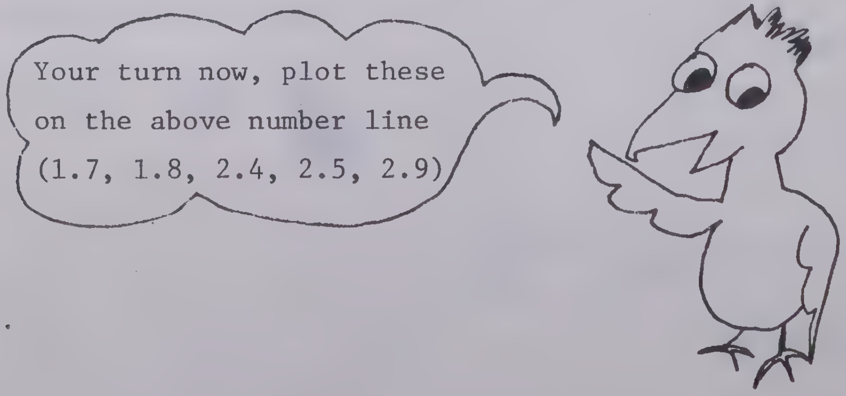

A B C D E F G H I J K L M N
3.8 ___ ___ ___ ___ 4.3 ___ ___ ___ ___ ___ 4.9 ___ ___ ___ ___ 5.4 ___


Now let's try these numbers (0.2, 0.7, 0.9, 1.5) And plot them on a number line as shown below.


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4

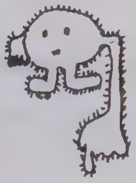
F.


1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1

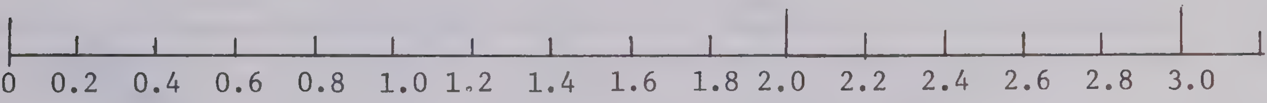

Your turn now, plot these on the above number line (1.7, 1.8, 2.4, 2.5, 2.9)

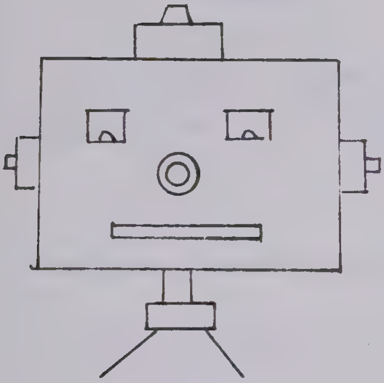
Plot these points on the number line below:

(0.8, 1.0, 1.2, 2.0, 2.4, 2.6, 2.8)



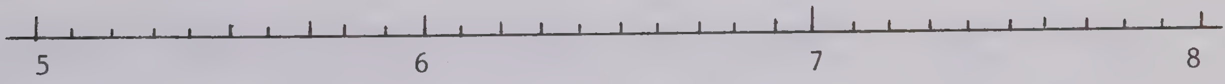
G.



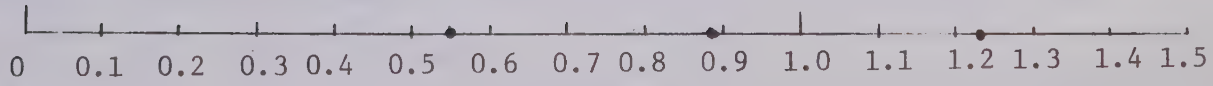


Fill in the number line below
and then plot these numbers:
(6.7, 5.9, 7.4, 6.2, 5.3, 7.6,5)

* H.

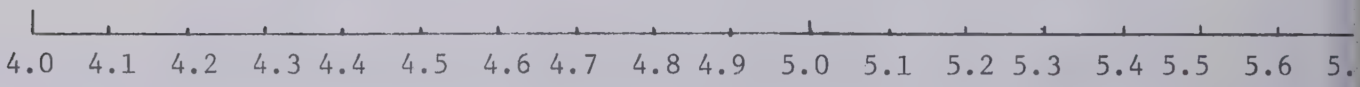


LOOK AT THIS NUMBER LINE



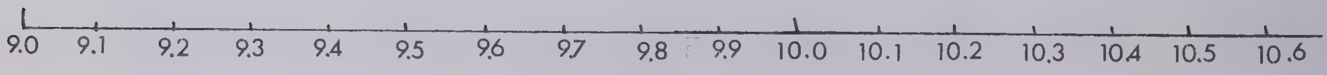
Use your ruler to determine the three numbers that are plotted.

*I. Plot these numbers on the line below:
(4.05, 4.24, 4.78, 5.09, 5.30, 5.62)

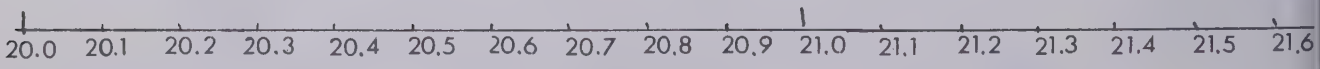


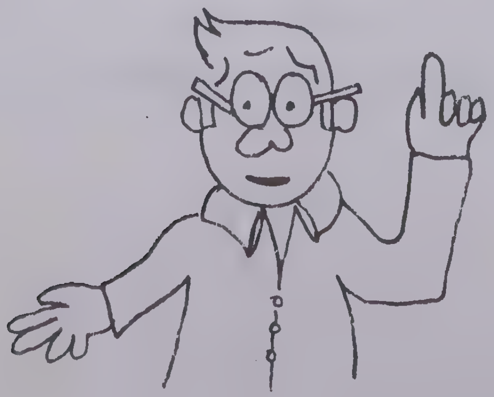
*J. Plot the given numbers for the problems below.

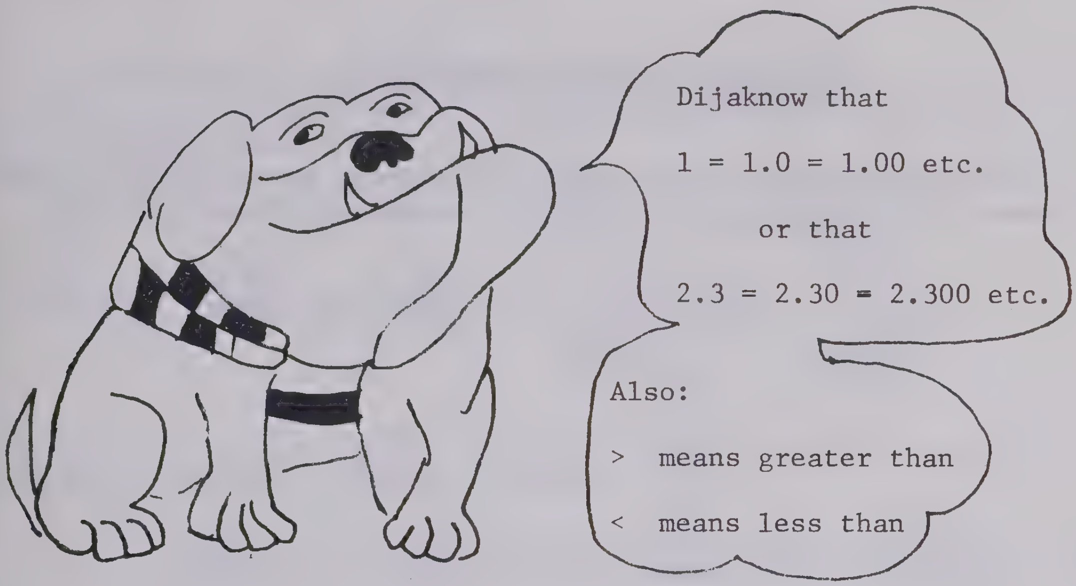
1. (9.5, 9.74, 9.91, 10.04, 10.46)



2. (20.1. 20.45, 20.66, 20.92, 21.49)







3. Complete the sentences below by using > , < , = .

a. 0.6 ? 0.9

b. 1.2 ? 1.23

c. 0.6 ? 0.77

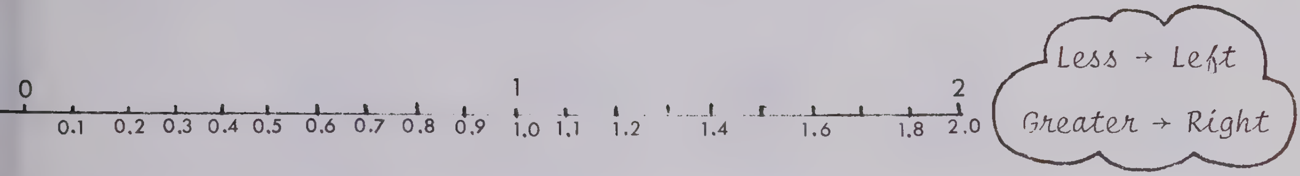
d. 23.6 ? 23.66

e. 21.78 ? 21.79

f. 0.71 ? 0.70

g. 1.3 ? 1.30

h. 0.6 ? 0.60



4. Study the above number line and arrange the following sets of numbers in order. Begin with the smallest number.

a. (1.5, 0.6, 1.2, 0.9)

b. (0.7, 0.5, 0.1)

c. (0.1, 1.0, 0.2, 2.0)

d. (0.6, 0.7, 0.1, 1.02)

e. (0.0, 1.0, 0.9, 0.6)

f. (0.8, 0.7, 0.9, 0.6)

g. (1.9, 1.4, 0.9, 0.4)

ADDITION OF DECIMAL NUMERALS

Addition of decimal numerals is made easier by placing numerals in straight vertical lines. The decimal points should be placed one above the other.

Like this	Not like this
1.4 8.2 11.6 3.75	1.4 8.2 11.6 3.75

A. Look at the examples given, then aswer the questions given.

1. 0.1
+0.2
0.3

2. 0.2
+ 0.3
0.5

3. 0.7
+0.3
1.0

4. 0.8
+0.4
1.2

5. 0.6
+0.3

6. 0.9
+ 0.6

7. 0.3
0.7
0.8

8. 2.5
+2.1

9. 2.9
+2.8

10. 3.8
+9.7

11. 4.9
+9.4

12. 11.7
+28.6

13. 49.9
+83.2

14. 117.6
+109.4

15. 90.2
80.6
79.3

16. 66.7
33.3
91.2
47.5

17. 21.8
79.3
54.6
37.2

18. 61.9
201.3
400.7
39.8

19. 307.4
11.8
8.7
142.5

20. 0.9
11.5
301.6
42.3

21. 99.1
75.2
492.6
307.8

B. The following questions are written horizontally. Before answering, all numerals should be placed vertically as shown in the example below.
NOTE: All decimal points are placed above the other.

e.g. 10.4 + 8.6 + 25.3 + 90.4 = ? answer: 10.4
8.6
25.3
90.4
134.7

ADD:

1. 3.5 + 6.9 + 9.6 + 11.4 + 8.0 =
2. 17.2 + 3.8 + 2.7 + 13.3 + 20.1 =
3. 24.1 + 19.5 + 11.7 + 38.4 + 50.6 =
4. 78.9 + 35.3 + 64.7 + 88.1 + 70.7 =
5. 93.2 + 89.6 + 90.4 + 82.5 + 103.4 =

The first set of problems had only one digit after the decimal point. These questions have one or two digits after the decimal point. Study the examples below.

```
 0.94      1.23      3.69     13.79      82.48
+0.06     +0.08     +1.98      1.98      11.12
-----     -----     -----      0.24       6.49
 1.00      1.31      5.67     20.10      49.67
                              -----     ------
                              36.11     149.76
```

Add the following columns of numbers:

```
A.  1.  0.08     2.  3.11     3.  15.60     4.  77.05
        0.92         4.09         12.87         24.35
        0.17         2.73         32.93         15.68
        0.52         4.68         50.01          7.26
        ----         ----         -----         -----

    5.  22.79    6.  1.12     7.  7.60
       105.62        2.69         2.15
       170.80        4.98         8.40
        89.68        4.98         9.63
       ------        3.69        52.94
                     ----        -----
```

The next group of questions have both one and two digits after the decimal point.

Study the examples and solve the questions below.

```
10.9      14.76     0.3
 0.63      3.69     0.68
 2.75      0.3      1.15
 6.1      11.4      0.49
-----      0.08     0.8
20.38     -----     ----
          30.23     3.42
```

```
B.  1.  9.69     2.  0.98     3.   5.7      4.   0.7
        6.49         0.6          13.22         56.28
        0.2          0.98         49.8          83.49
        0.45         1.5           0.45          0.6
        ----         ----         -----         -----

    5.  11.1     6.  77.3     7.  100.15    8.  93.5
         3.6          0.09         90.68        28.6
        29.18        11.34         40.39         0.15
        15.69         1.8           7.09         6.48
         6.8         70.65         25.8         31.72
        -----        -----        ------        -----
```

SUBTRACTION OF DECIMAL NUMERALS

There are three examples of subtraction problems given below. You will notice that the answers are the same except for the location of the decimal point. Notice that when you are subtracting, the decimal points also line up.

$\begin{array}{r} 150 \\ -\ 86 \\ \hline 64 \end{array}$ $\quad$ $\begin{array}{r} 1.50 \\ -\ .86 \\ \hline .64 \end{array}$ $\quad$ $\begin{array}{r} 15.0 \\ -\ 8.6 \\ \hline 6.4 \end{array}$

A. Subtract the following:

1. $\begin{array}{r} 4.7 \\ -2.1 \\ \hline \end{array}$ 2. $\begin{array}{r} 6.9 \\ -3.8 \\ \hline \end{array}$ 3. $\begin{array}{r} 10.7 \\ -\ 3.2 \\ \hline \end{array}$ 4. $\begin{array}{r} 15.6 \\ -\ 4.1 \\ \hline \end{array}$ 5. $\begin{array}{r} 19.3 \\ -12.2 \\ \hline \end{array}$

6. $\begin{array}{r} 25.7 \\ -14.7 \\ \hline \end{array}$ 7. $\begin{array}{r} 17.8 \\ -\ 9.9 \\ \hline \end{array}$ 8. $\begin{array}{r} 26.3 \\ -14.8 \\ \hline \end{array}$ 9. $\begin{array}{r} 31.9 \\ -17.2 \\ \hline \end{array}$ 10. $\begin{array}{r} 49.6 \\ -39.8 \\ \hline \end{array}$

11. $\begin{array}{r} 4.86 \\ -2.75 \\ \hline \end{array}$ 12. $\begin{array}{r} 13.26 \\ -\ 9.48 \\ \hline \end{array}$ 13. $\begin{array}{r} 73.54 \\ -50.82 \\ \hline \end{array}$ 14. $\begin{array}{r} 29.00 \\ -11.93 \\ \hline \end{array}$ 15. $\begin{array}{r} 33.64 \\ -\ 17.48 \\ \hline \end{array}$

The questions below must be rewritten so that the decimal points are lined up one above the other.

Example: 29.83 - 11.89 = Answer: $\begin{array}{r} 29.83 \\ -11.89 \\ \hline 17.94 \end{array}$

B. 1. 73.60 - 17.52 = 2. 39.64 - 18.73 = 3. 80.80 - 56.79 =

4. 143.22 - 71.64 =

C. e.g. $\begin{array}{r} 29.6 \\ -16.83 \\ \hline \end{array}$

Should be written as: $\begin{array}{r} 29.60 \\ -16.83 \\ \hline 12.77 \end{array}$ *Write in zeros when necessary.*

Solve and check the problems given.

1. $\begin{array}{r} 59.07 \\ -10.93 \\ \hline \end{array}$ 2. $\begin{array}{r} 34.68 \\ -29.73 \\ \hline \end{array}$ 3. $\begin{array}{r} 129.61 \\ -101.96 \\ \hline \end{array}$ 4. $\begin{array}{r} 150.09 \\ -\ 16.83 \\ \hline \end{array}$ 5. $\begin{array}{r} 251.37 \\ -159.13 \\ \hline \end{array}$

6. $\begin{array}{r} 76.74 \\ -37.19 \\ \hline \end{array}$ 7. $\begin{array}{r} 92.48 \\ -28.29 \\ \hline \end{array}$ 8. $\begin{array}{r} 453.60 \\ -271.35 \\ \hline \end{array}$ 9. $\begin{array}{r} 625.52 \\ -401.17 \\ \hline \end{array}$ 10. $\begin{array}{r} 227.46 \\ -169.52 \\ \hline \end{array}$

Below is a sample sales receipt for a day's work from a stereo shop.

MARCH 20

6.49	Records
6.49	Records
4.49	Records
3.98	Records
5.98	Tape
5.98	Tape
19.98	Acc.
24.95	Acc.
6.49	Records
4.98	Records
6.50	Tape
26.00	Tape
14.94	Records
24.90	Tape
249.00	Equip.
19.90	Records
79.00	Equip.
549.00	Equip.
36.40	Records
12.98	Records
4.49	Records
9.98	Records
5.49	Records
6.49	Records
5.50	Acc.
6.49	Records
8.00	Acc.
1,249.98	Equip.
240.00	Equip.
29.90	Tape
23.88	Records
23.45	Records

Place each of these sales in the proper column on the following page.

Follow the other instructions to get the total profit for a day's sale.

	Records (Rec.)	Tapes	Accessories (Acc.)
Totals	(A)	(B)	(C)

	Equipment (Equip.)
Total	(D)

(E) Total Sales ____________ Add the results from (A), (B), (C), (D) to get the Total Sales.

The store had 6 people working: 4 people worked 9 hrs each at a rate of $5.50 an hour. The other two people worked 9 hr. each at $2.75 an hour. How much money was paid to the employees?

(F) ______________________________

____

In addition to wages the 4 salesmen also earned a commission of 10% on the equipment sold. To find out how much commission was paid, take the whole number of dollars in box (D) and divide by 10.

(G) ______________________________

Commission paid = ______________

The store's cost price for the items sold amounted to $1 623.40. In addition, a daily operating expense amounted to $36.08.

What was the total overhead? (Add boxes (F) and (G) and the cost price and daily operating expense).

____

Total Overhead (H) ______________

Total Profit = Total Sales (E) - Total Overhead (H)

A. Study these:

4.1 x 1 = 4.1
4.1 x 10 = 41
4.1 x 100 = 410
4.1 x 1 000 =4 100

Can you make up a rule which you could use to get the answers to the questions like these in your head? ______________________________

____

More study:

3.025 x 1 = 3.025
3.025 x 10 = 30.25
3.025 x 100= 302.5
3.025 x 1 000 = 3 025
3.025 x 10 000 = 30 250

RULE: Multiplication by 10's:

Move the decimal point to the right the same number of spaces as there are zeros in the multiplier.

Exercises:

1. a. 3.06 x 1 =
   b. 3.06 x 10 =
   c. 4.02 x 100 =
   d. 4.02 x 1 000 =
   e. 5 x 10 =
   f. 5 x 100 =
   g. 3.002 x 1 =
   h. 3.002 x 1 000 =

B. Study these:

25 ÷ 1 = 25
25 ÷ 10 = 2.5
25 ÷ 100 = .25
25 ÷ 1 000 = .025

RULE: Division by 10's:

Move the decimal point to the left the same number of spaces as there are zeros in the divisor.

Exercises:

2. a. 3.1 ÷ 1 =
   b. 3.1 ÷ 10 =
   c. 24.61 ÷ 100 =
   d. 24.61 ÷ 1 000 =
   e. 38 ÷ 1 =
   f. 38 ÷ 100 =
   g. 1.09 ÷ 100 =
   h. 1.09 ÷ 10 000 =

MULTIPLICATION OF DECIMALS

To multiply any two decimal numbers follow these steps:

1. multiply the numbers as you would ordinarily.
2. count the number of digits from the decimal point to the end of the number. Do this for both numbers, and add the results.
3. from the end of your product (answer) count to the left the same number of digits as you calculated in step (2).

Look at the examples:

Example 1:
0.21 (2 places)
x 3. (0 places)
First multiply 0.63 (2 places left)
21 x 3 = 63

Example 2: 0.06 (2 places)
x 0.4 (1 place)
First mult. 0.024 (3 places)
6 x 4 = 24

Exercises:

A. Multiply

1. 0.5 x 0.7 =
2. 0.9 x 0.6 =
3. 0.3 x 0.52 =
4. 5 x 0.24 =
5. 0.41 x 0.09 =
6. 0.03 x 0.12 =
7. 1.2 x 0.34 =
8. 2.81 x 0.4 =
9. 9.6 x 0.03 =
10. 2.41 x 1.32 =

To divide decimal numbers follow these rules:

1. Move the decimal point in the divisor to the end of the number.
2. Move the decimal point in the dividend the same number of places as in Step 1.
3. Move the decimal point directly above the decimal point in the dividend. (After Step 2)
4. Divide as you would normally. (The decimal point in the answer is automatically placed because of Step 3)

Example 1:
0.4
8) 3.2
3 2
0
no move of decimal point necessary

Example 2:
2 1.
0.3) 6.3
6 x
0
3
3
0
Move 1 place

B. Divide:

1. $4\overline{)34.0}$
2. $12\overline{)1.44}$
3. $9\overline{)0.36}$
4. $8\overline{)5.6}$
5. $5\overline{)1.25}$
6. $43\overline{)30.1}$
7. $20\overline{)174.0}$
8. $8\overline{)198.08}$
9. $79\overline{)2.686}$
10. $8\overline{)58.48}$

C. Move the decimal point the required number of places in the divisor and dividend. DO NOT DIVIDE. The first one is done for you.

1. $0.\underset{\curvearrowright}{4}\overline{)2.\underset{\curvearrowright}{4}} \longrightarrow 4\overline{)24}$
2. $0.5\overline{)0.35} \longrightarrow 5\overline{)35}$
3. $0.06\overline{)3.42} \longrightarrow 6\overline{)342}$
4. $0.19\overline{)0.874} \longrightarrow 19\overline{)874}$
5. $1.1\overline{)693} \longrightarrow 11\overline{)693}$
6. $0.08\overline{)58.4} \longrightarrow 8\overline{)584}$

D. Student Exercises: Write the quotients of the following:

1. $0.4\overline{)29.6}$
2. $0.08\overline{)30.56}$
3. $0.7\overline{)58.10}$
4. $4.1\overline{)36.9}$
5. $0.09\overline{)47.7}$
6. $0.67\overline{)5.36}$
7. $8.4\overline{)16.80}$
8. $0.7\overline{)308.0}$
9. $9.6\overline{)1\ 824}$
10. $0.71\overline{)326.6}$

EXERCISES: UNIT III OBJECTIVE C-12

A. Multiplication Symbols:

To show multiplication, you could use two different symbols; "x" or ()

Example 1: multiply five by four 5×4

or $5(4)$
or $(5)(4)$

Example 2: Multiply an unknown number by three-fourths:

$\frac{3}{4}y$ or $\frac{3}{4}(y)$ or $(\frac{3}{4})(y)$ or $\frac{3}{4} \times y$

Why would the last way be confusing?

Exercises:

1. Write the following descriptions in 2 different ways:

a. five times three __________ __________

b. one-half multiplied by three-fifths __________ __________

c. three eighths times an unknown __________ __________

B. Division Symbols:

Division can also be shown by making use of different symbols;

$\div$, $-$, $\overline{)\ \ }$.

Example 3: six divided by three

write $6 \div 3$ or $\frac{6}{3}$ or $3\overline{)6}$

Example 4: the *QUOTIENT* of five and an unknown

write $5 \div y$ or $\frac{5}{y}$ or $y\overline{)5}$

NOTE: the "divided by" goes outside the $\overline{)\ \ }$

Exercises:

1. Write the following descriptions in symbols:

a. fourteen divided by 7: __________ __________ __________

b. sixteen divided by 5: __________ __________ __________

c. an unknown divided by six: __________ __________ __________

Substitution

To substitute means to replace one thing by another. In mathematics, substitution means to replace letters (variables) by numbers.

Example 1: Evaluate $3y + 5$ when $y = 2$

1. Replace the y by 2: $3(2) + 5$
2. Compute the answer by following the ordinary rules (PMDAS):

Note: Use parentheses to remind yourself of multiplication

$$\begin{aligned} & 3(2) + 5 \\ &= 6 + 5 \\ &= 11 \end{aligned}$$

Example 2: Evaluate $2y - \frac{1}{4}$ when $y = \frac{3}{4}$

$$\begin{aligned} & 2(\tfrac{3}{4}) - \frac{1}{4} \\ &= \frac{6}{4} - \frac{1}{4} \\ &= \frac{5}{4} \text{ or } 1\frac{1}{4} \end{aligned}$$

Example 3: Evaluate $5r + 3.8$ when $r = 2.1$

$$\begin{aligned} & 5(2.1) + 3.8 \\ &= 10.5 + 3.8 \\ &= 14.3 \end{aligned}$$

NOTE: Substitution and Evaluation are carried out using the same methods for: whole numbers, fractions, decimals.

Evaluate the following by substitution for the variables.

1. Replace letters
2. Compute

1. $2 + y$ use $y = 19$
2. $5 - y$ use $y = 3$
3. $6y$ use $y = 5$
4. $3y + 2$ use $y = 6$
5. $4y - 5$ use $y = 2$
6. $2y + \frac{1}{2}$ use $y = \frac{3}{4}$
7. $3y - \frac{1}{3}$ use $y = \frac{1}{3}$
8. $5y + 6.2$ use $y = 4.1$
9. $4y - 3.8$ use $y = 9$

Solving Conditions

To solve conditions remember - Opposite Operations

Operation	Opposite
+	−
−	+
x	÷
÷	x

Type I: $A + x = B$

Example 1:

$$\begin{array}{rcr} x + 5 & = & 16 \\ -\ 5 & = & -5 \\ \hline x & = & 11 \end{array}$$

the condition says to add, so to solve it, you subtract.

Example 2:

$$\begin{array}{rcr} 1.3 + y & = & 1.9 \\ -1.3 \quad & & -1.3 \\ \hline & & 0.6 \end{array}$$

Example 3:

$$\begin{array}{rcr} x - \frac{1}{5} & = & \frac{3}{5} \\ +\frac{1}{5} & = & +\frac{1}{5} \\ \hline x & = & \frac{4}{5} \end{array}$$

NOTE: the method is the same for:
-whole numbers
-fractions
-decimals

the number on the same side as the variable is the one to add or subtract

Exercises: Solve for the variable.

1. a. $x + 9 = 17$
   b. $x + 5 = 21$
   c. $x + \frac{1}{3} = \frac{2}{3}$
   d. $x - \frac{1}{4} = \frac{3}{4}$
   e. $x + 6.1 = 15.03$
   f. $x - 8.1 = 3.2$
   g. $x + 5 = 12\frac{1}{2}$
   h. $x - 6.3 = 9$

Type II: $Ax = B$

Example 1: $3x = 15$

$3x \div 3 = 15 \div 3$

$x = 5$

the condition says to multiply, so to solve it, you divide

Example 2: $\frac{1}{2} x = 6$

$\frac{1}{2}x \div \frac{1}{2} = 6 \div \frac{1}{2}$

$x = 6 \times \frac{2}{1}$ (Reciprocal)

$x = 12$

Example 3: $4.1x = 16.4$

$4.1x \div 4.1 = 16.4 \div 4.1$

$x = 4$

NOTE: the method is the same for

- whole numbers

- fractions

- decimals

Divide by the number on the same side as the variable.

Exercises:

Solve for the variable:

2. a. $5x = 30$

b. $3x = 21$

c. $\frac{1}{2} x = 5$

d. $\frac{1}{3} x = \frac{5}{8}$

e. $6.1x = 36.6$

f. $4.1x = 10.25$

g. $5.03x = 55.33$

*h. $2\frac{1}{2} x = 10$

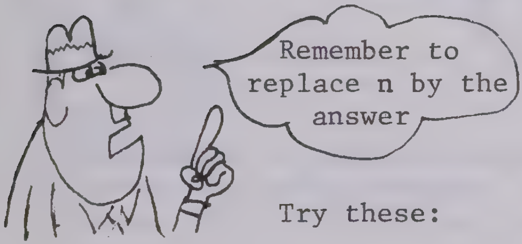
A. Are these answers correct? Use substitution to check.

For example:

Question	Answer	Check		Right or Wrong
		LHS	RHS	
$3n = 1.8$	$n = 0.6$	$3n$ 3×0.6 1.8	1.8	✓
		LHS= RHS		

Can you finish this?

Question	Answer	Check		Right or Wrong
		LHS	RHS	
$4 - n = 3.6$	$n = 0.4$	$4 - n$ $4 - \_\_\_$	3.6	

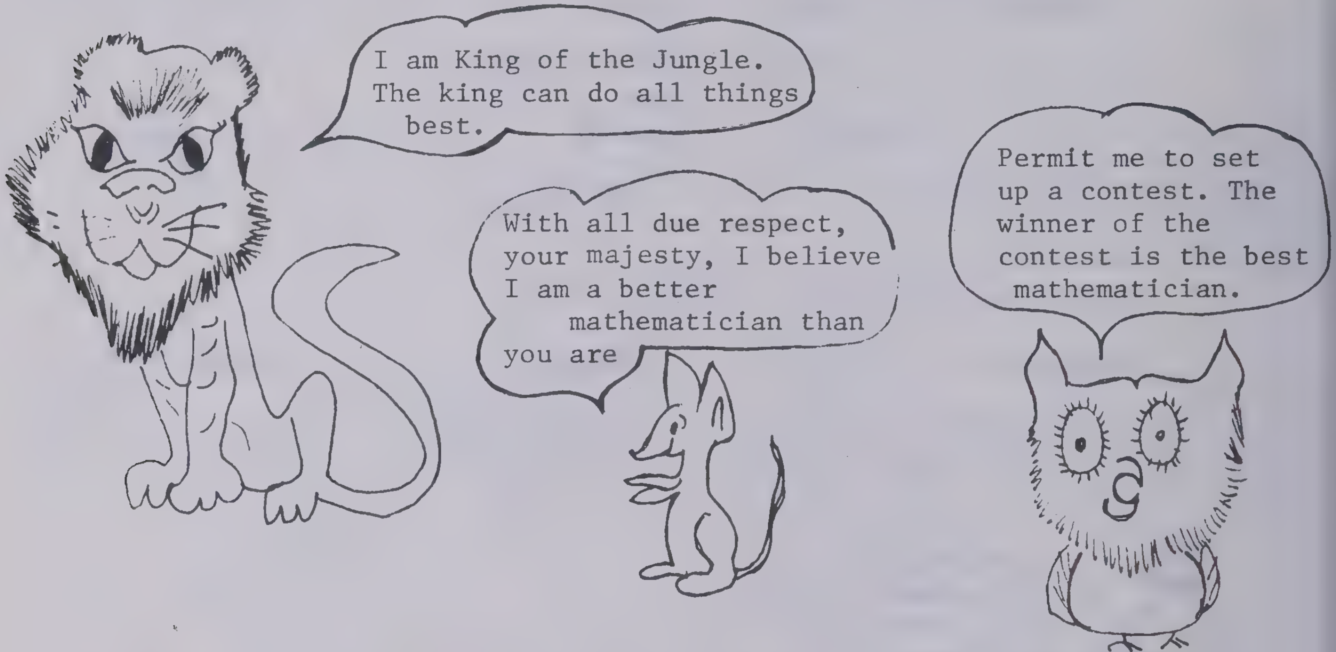

Remember to replace n by the answer

Try these:

	Question	Answer	Check	Right or Wrong
1.	$7n = 1.4$	$n = 2$		
2.	$3.6 = 6 - n$	$n = 2.4$		
3.	$1.5n = 75$	$n = 50$		
4.	$7\frac{1}{2} + n = 9\frac{3}{4}$	$n = 2\frac{1}{4}$		
5.	$0.5n = 1$	$n = 0.2$		
6.	$1\frac{1}{2}\,n = 6\frac{1}{2}$	$n = 4$		
7.	$0.328 + n = 17.3$	$n = 16.792$		
8.	$4 = \frac{2}{3}\,n$	$n = 9$		

THE GREATEST MATHEMATICIAN

Leo, the Lion, and Aldridge, the Mouse, were having a dispute about who the greatest mathematician was.


I am King of the Jungle. The king can do all things best.
With all due respect, your majesty, I believe I am a better mathematician than you are
Permit me to set up a contest. The winner of the contest is the best mathematician.

These are the questions Leo and Aldridge were given. Beside each question is the answer each of them found. You are to be the judge of the competition. Use substitution to check their answers. Who was the greatest mathematician?

Question	Aldridge's Answer	Leo's Answer	Who was right?
1. $x + 0.5 = 1.52$	$x = 1.2$	$x = 1.02$	______________
2. $1.08 = 0.3n$	$n = 3.6$	$n = .36$	______________
3. $0.06 + r = 2$	$r = 1.94$	$r = .194$	______________
4. $7a = 3\frac{1}{2}$	$a = \frac{1}{3}$	$a = \frac{1}{2}$	______________
5. $\frac{7}{8} = m - \frac{3}{4}$	$m = 1\frac{5}{8}$	$m = \frac{1}{8}$	______________

Who was the best mathematician? ______________

KEY TO EXERCISES

LEVEL 7

UNIT III

RATIONAL NUMBERS

KEY TO EXERCISES

Objective No. B-1

B. 1. $\frac{3}{4}$ 4. $\frac{1}{4}$

2. $\frac{1}{2}$ 5. $\frac{7}{4}$

3. $\frac{6}{8}$ 6. $\frac{8}{8}$

C. 1. a. [✓ $\frac{3}{5}$] f. $\frac{5}{15}$ 2. a. $\frac{1}{3}$ b. $\frac{1}{2}$ c. $\frac{3}{4}$

b. $\frac{2}{4}$ g. [✓ $\frac{4}{5}$] d. $\frac{1}{2}$ e. $\frac{1}{2}$ f. $\frac{1}{2}$

c. $\frac{4}{10}$ h. [✓ $\frac{3}{8}$]

d. [✓ $\frac{2}{7}$] i. $\frac{2}{10}$

e. [✓ $\frac{1}{3}$] j. [✓ $\frac{13}{14}$]

D. 1. a. ✓ b. c. 2. a. yes b. no c. no

d. e. f. ✓ d. yes e. no f. no

g. yes

E. A. 1. $\frac{5}{3}$ 6. $\frac{21}{8}$ B. 1. $2\frac{1}{2}$ 5. $1\frac{1}{3}$

2. $\frac{9}{4}$ 7. $\frac{35}{3}$ 2. $3\frac{1}{2}$ 6. $1\frac{3}{10}$

3. $\frac{8}{5}$ 8. $\frac{65}{7}$ 3. $1\frac{1}{4}$ 7. $2\frac{5}{10}$ or $2\frac{1}{2}$

4. $\frac{25}{7}$ 9. $\frac{65}{9}$ 4. $1\frac{2}{5}$ 8. $3\frac{1}{5}$

5. $\frac{4}{3}$ 10. $\frac{27}{4}$

F. A. 1. $\frac{2}{3}$, $\frac{8}{11}$ 6. $\frac{3}{7}$, $\frac{4}{9}$

2. $\frac{3}{8}$, $\frac{2}{5}$ 7. $\frac{1}{4}$, $\frac{1}{3}$

3. $\frac{3}{4}$, $\frac{7}{8}$ 8. $\frac{5}{8}$, $\frac{2}{3}$, $\frac{3}{4}$

4. $\frac{5}{9}$, $\frac{6}{7}$ *9. $\frac{1}{6}$, $\frac{2}{11}$, $\frac{4}{15}$

5. $\frac{3}{4}$, $\frac{5}{6}$ *10. $\frac{3}{5}$, $\frac{2}{3}$, $\frac{3}{4}$

Key to Exercises

Objective No. B-3

A. The early bird catches the worm.

Objective No. B-6

One times zero equals zero.

1. 6
2. 12
3. $\frac{2}{3}$
4. $7\frac{1}{2}$
5. 241.32
6. 8
7. $\frac{1}{2}$
8. $5\frac{1}{4}$
9. 92
10. 6.843
11. 0
12. 0
13. 0
14. 0
15. 0

Objective No. B-7

A. 2. $\frac{2}{3}, \frac{16}{24}, \frac{24}{36}, \frac{32}{48}, \ldots$

3. $\frac{3}{4}, \frac{18}{24}, \frac{27}{36}, \frac{36}{48}, \ldots$

4. $\frac{5}{3}, \frac{20}{12}, \frac{30}{18}, \frac{40}{24}, \ldots$

5. $\frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \ldots$

6. $\frac{1}{1}, \frac{10}{10}, \frac{15}{15}, \frac{20}{20}$

7. $\frac{6}{2}, \frac{9}{3}, \frac{12}{4}, \ldots$

8. $\frac{14}{16}, \frac{21}{24}, \frac{28}{32}, \ldots$

B. 1. $m = 4$

2. $m = 2$

3. $m = 10$

4. $m = 5$

5. $m = 4$

6. $m = 18$

Charge Now, Pay Later

Only if they carry credit cards in their pouches.

Objective No. B-10

Label the Box

Kit for adding and subtracting fractions.

Objective No. B-10

A. 1. $\frac{2}{2} = 1$ 2. $\frac{3}{4}$ 3. $\frac{6}{8} = \frac{3}{4}$ 4. $\frac{4}{10} = \frac{2}{5}$

5. $\frac{5}{5} = 1$ 6. $\frac{3}{4}$ 7. $\frac{10}{10} = 1$ 8. $\frac{7}{9}$

9. $\frac{13}{8} = 1\frac{5}{8}$ 10. $\frac{9}{6} = 1\frac{1}{2}$ 11. $\frac{6}{7}$ 12. $\frac{14}{12} = 1\frac{1}{6}$

B. 1. $\frac{1}{5}$ 2. $\frac{1}{4}$ 3. $\frac{1}{4}$ 4. $\frac{1}{2}$ 5. $\frac{1}{2}$

6. $\frac{2}{11}$ 7. $\frac{5}{9}$ 8. $1\frac{7}{8}$ 9. 0 10. $\frac{1}{5}$

Objective No. B-11

1. $\frac{9}{5}$
2. $\frac{11}{2}$
3. 1
4. $\frac{2}{1}$
5. $\frac{8}{3}$
6. $\frac{3}{5}$
7. $\frac{1}{4}$
8. $\frac{5}{1}$
9. $\frac{1}{2}$
10. 1

Winners never quit, quitters never win.

Objective No. B-12

A. 4. a. $\frac{4}{2} = 2$ b. $\frac{8}{15}$ c. $\frac{6}{35}$ d. $\frac{12}{11}$ e. $\frac{18}{55}$

f. $\frac{8}{1}$ g. $\frac{4}{9}$ h. $\frac{1}{4}$ i. $\frac{5}{7} \times \frac{3}{2}$ j. $\frac{6}{7}$

B. 2. Invert the number you are dividing by and multiply.

3. b. $\frac{10}{9}$ e. $\frac{3}{8}$ h. $\frac{8}{1}$

c. $\frac{20}{63}$ f. $\frac{8}{33}$ i. $\frac{2}{3}$

d. $\frac{8}{3}$ g. $\frac{14}{75}$ j. $\frac{26}{7}$

X	X		X	X
X		X	X	
	X		X	
X	X	X	X	X
X	X		X	X

BINGO

Key to Exercises

Objective No. B-15

a. $\frac{19}{20}$ b. $\frac{9}{12} = \frac{3}{4}$ c. $\frac{3}{15} = \frac{1}{5}$ d. 1 e. $\frac{1}{18}$

Objective No. B-16

A. 1. >

2. <

3. =

4. >

5. <

B. 1. <

2. >

3. =

4. <

5. >

6. =

7. >

8. =

9. <

10. <

C. 1. $\frac{5}{9}, \frac{5}{7}, \frac{4}{5}$

2. $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$

3. $\frac{1}{4}, \frac{3}{8}, \frac{2}{5}$

4. $\frac{3}{10}, \frac{4}{11}, \frac{5}{12}$

5. $\frac{4}{3}, \frac{3}{2}, \frac{8}{5}$

Objective No. C-2

First Puzzle: A bug bothers you and a cactus needles you.
Second Puzzle: A seasick tourist

Objective No. C-3

Review Exercises

1. a. $\frac{8}{10} + \frac{6}{100} + \frac{9}{1\ 000}$

b. $\frac{4}{10} + \frac{0}{100} + \frac{2}{1\ 000}$

c. $\frac{3}{10} + \frac{1}{100}$

d. $\frac{4}{10} + \frac{2}{100} + \frac{3}{1\ 000}$

e. $\frac{0}{10} + \frac{0}{100} + \frac{6}{1\ 000}$

f. $\frac{3}{10} + \frac{2}{100} + \frac{0}{1\ 000} + \frac{1}{10\ 000}$

g. $\frac{5}{10}$

h. $\frac{0}{10} + \frac{3}{100} + \frac{4}{1\ 000}$

i. $\frac{5}{10} + \frac{6}{100} + \frac{0}{1\ 000}$

j. $\frac{8}{10} + \frac{0}{100} + \frac{2}{1\ 000}$

k. $\frac{9}{10} + \frac{2}{100}$

2. a. 0.08

b. 0.95

c. 0.7

d. 0.106

e. 0.222

f. 0.20

g. 0.596

h. 0.02

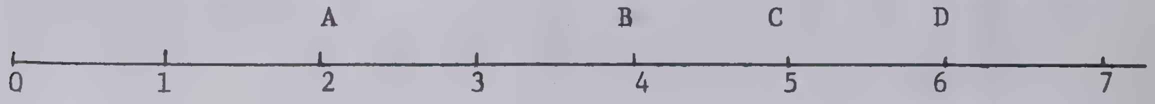
i. 0.98

j. 0.603

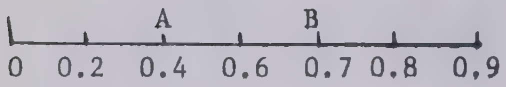
Key to Exercises

Objective Nos. C-4, C-5

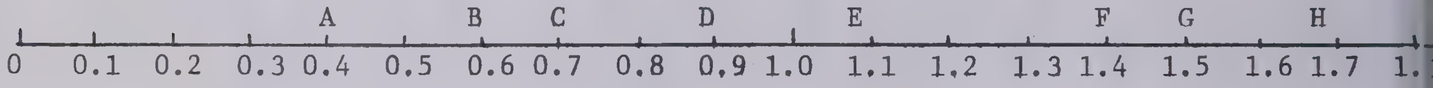
A.



B.



C.



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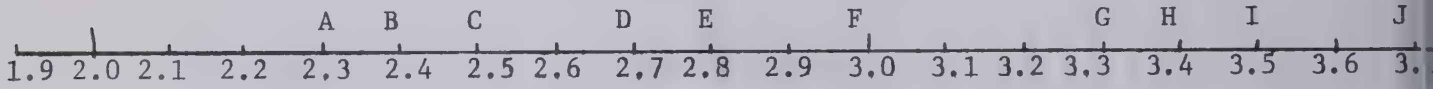
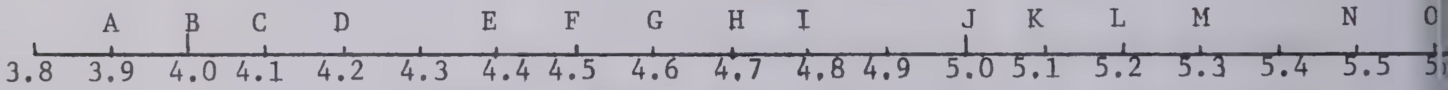


E.



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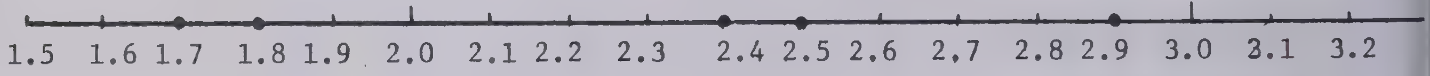

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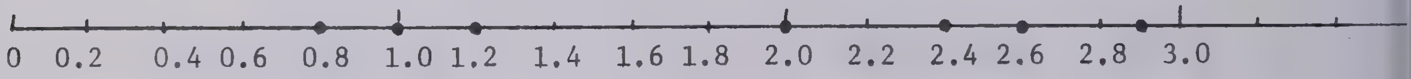
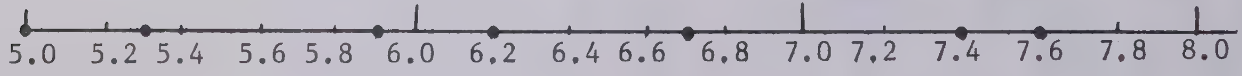
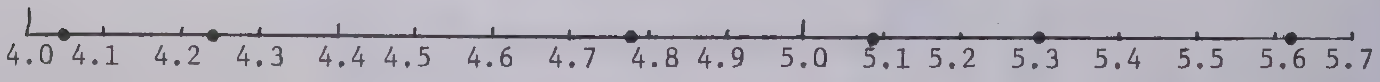


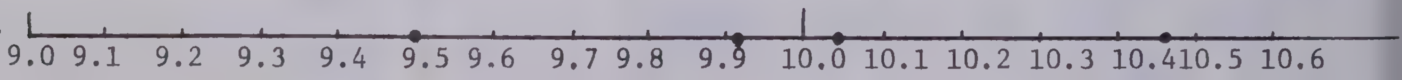
H.



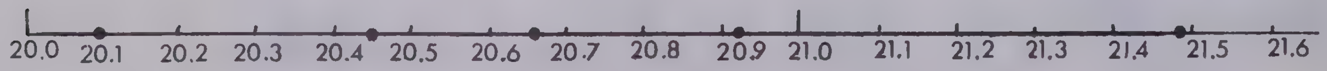
I.



J. 1.



2.



Key to Exercises:

Objective No. C-4, C-5

3. a. <
b. <
c. <
d. <
e. <
f. >
g. =
h. =

4. a. (0.6, 0.9, 1.2, 1.5)
b. (0.1, 0.5, 0.7)
c. (0.1, 0.2, 1.0, 2.0)
d. (0.1, 0.6, 0.7, 1.02)
e. (0.0, 0.6, 0.9, 1.0)
f. (0.6, 0.7, 0.8, 0.9)
g. (0.4, 0.9, 1.4, 1.9)

Objective No. C-6

A. 5. 0.9
6. 1.5
7. 1.8
8. 4.6
9. 5.7
10. 13.5
11. 14.3
12. 40.3
13. 133.1
14. 227.0
15. 250.1
16. 238.7
17. 192.9
18. 703.7
19. 470.4
20. 356.3
21. 974.7

B. 1. 39.4 2. 57.1 3. 144.3 4. 337.7 5. 459.1

Part 2

A. 1. 1.69
2. 14.61
3. 111.41
4. 124.34
5. 388.89
6. 17.46
7. 80.72

B. 1. 16.83
2. 4.06
3. 69.17
4. 141.07
5. 66.37
6. 161.18
7. 264.11
8. 160.45

Subtraction:

A. 1. 2.6
2. 3.1
3. 7.5
4. 11.5
5. 7.1
6. 11.0
7. 7.9
8. 11.5
9. 14.7
10. 9.8
11. 2.11
12. 3.78
13. 22.72
14. 17.07
15. 16.16

Objective No. C-6

Subtraction:

B. 1. 56.08
2. 20.91
3. 24.01
4. 71.58

C. 1. 48.14
2. 4.95
3. 27.65
4. 133.26
5. 92.24
6. 39.55
7. 64.19
8. 182.25
9. 224.35
10. 57.94

Mathimagination

A.	Records	$ 203.90
B.	Tapes	99.26
C.	Acc.	63.93
D.	Equip.	2,366.98
E.	Total Sales	2,734.07
F.	Wages	247.50
G.	Commission	236.60
H.	Overhead	2,143.58
	Total Profit	590.49

Objective No. C-8

1. a. 3.06
b. 30.6
c. 402
d. 4 020
e. 50
f. 500
g. 3.002
h. 3 002

2. a. 3.1
b. 0.31
c. 0.246 1
d. 0.024 61
e. 38
f. 0.38
g. 0.010 9
h. 0.000 109

Key to Exercises

Objective No. C-9

A.
1. 0.35
2. 0.54
3. 0.156
4. 1.20
5. 0.036 9
6. 0.003 6
7. 0.408
8. 1.124
9. 0.288
10. 3.181 2

B.
1. 8.5
2. 0.12
3. 0.04
4. 0.7
5. 0.25
6. 0.7
7. 8.7
8. 24.76
9. 0.034
10. 7.31

C.
1. 24
2. 3.5
3. 342
4. 87.4
5. 6 930
6. 5 840

D.
1. 74
2. 382
3. 83
4. 9
5. 530
6. 8
7. 2
8. 440
9. 190
10. 460

Objective C-12

A. 1.
- a. 5×3 , $5(3)$, $(5)(3)$
- b. $\frac{1}{2} \times \frac{3}{5}$, $\frac{1}{2}(\frac{3}{5})$, $(\frac{1}{2})(\frac{3}{5})$
- c. $\frac{3}{8} \times y$, $\frac{3}{8}(y)$, $(\frac{3}{8})(y)$, $\frac{3}{8}y$

B. 1.
- a. $14 \div 7$, $\frac{14}{7}$, $7\overline{)14}$
- b. $16 \div 5$, $\frac{16}{5}$, $5\overline{)16}$
- c. $y \div 6$, $\frac{y}{6}$, $6\overline{)y}$

Objective C-13

1. 21
2. 2
3. 30
4. 20
5. 3
6. $\frac{8}{4}$ or 2
7. $\frac{2}{3}$
8. 26.3
9. 32.2

Objective No. C-14

1. a. 12
   b. 16
   c. $\frac{1}{3}$
   d. $\frac{4}{4}$ or 1
   e. 8.93
   f. 11.3
   g. $7\frac{1}{2}$
   h. 15.3

2. a. 6
   b. 7
   c. 10
   d. $\frac{15}{8}$ or $1\frac{7}{8}$
   e. 6
   f. 2.5
   g. 11
   *h. 4.

Objective No. C-15

A. 1. wrong
   2. correct
   3. correct
   4. correct
   5. wrong
   6. correct
   7. correct
   8. wrong

1. Leo
2. Aldridge
3. Aldridge
4. Leo
5. Aldridge

Aldridge was the best mathematician.

RATE, RATIO
&
PERCENT

LEVEL 7

UNIT IV

CONTENTS

Unit IV - Rate, Ratio & Percent

PAGE

OBJECTIVE 1: Maintain previously developed skills and ideas: change fractions to an equivalent fraction whose denominator is 100. .... 157.

OBJECTIVE 2: Express rates and ratios in the form $\frac{a}{b}$ . ... 163.

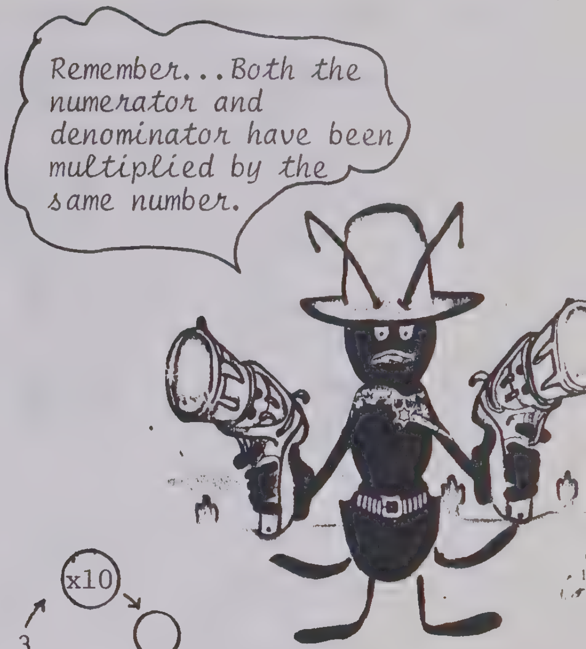
OBJECTIVE 3: Find the missing component in any rate or ratio expressed in the equivalence condition form. .... 168.

e.g. $(\frac{3}{5} = \frac{x}{20})$

KEY TO EXERCISES .... 170.

EXERCISES UNIT IV OBJECTIVE NO. 1

1. Fill in the ◯ in each question.


Remember...Both the numerator and denominator have been multiplied by the same number.

Example:

$$\begin{tikzcd} & \textcircled{x3} \arrow[dr] & \\ \frac{1}{2} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{6} \\ & \textcircled{x3} \arrow[ur] & \end{tikzcd}$$

Solution: $1 \times 3 = \textcircled{3}$

Thus: $\frac{1}{2} = \frac{\textcircled{3}}{6}$

(a)

$$\begin{tikzcd} & \textcircled{x5} \arrow[dr] & \\ \frac{1}{2} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{10} \\ & \textcircled{x5} \arrow[ur] & \end{tikzcd}$$

(b)

$$\begin{tikzcd} & \textcircled{x5} \arrow[dr] & \\ \frac{1}{4} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{20} \\ & \textcircled{x5} \arrow[ur] & \end{tikzcd}$$

(c)

$$\begin{tikzcd} & \textcircled{x10} \arrow[dr] & \\ \frac{3}{10} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{100} \\ & \textcircled{x10} \arrow[ur] & \end{tikzcd}$$

(d)

$$\begin{tikzcd} & \textcircled{x10} \arrow[dr] & \\ \frac{3}{4} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{40} \\ & \textcircled{x10} \arrow[ur] & \end{tikzcd}$$

(e)

$$\begin{tikzcd} & \textcircled{x20} \arrow[dr] & \\ \frac{1}{5} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{100} \\ & \textcircled{x20} \arrow[ur] & \end{tikzcd}$$

(f)

$$\begin{tikzcd} & \textcircled{x2} \arrow[dr] & \\ \frac{1}{10} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{20} \\ & \textcircled{x2} \arrow[ur] & \end{tikzcd}$$

(g)

$$\begin{tikzcd} & \textcircled{x5} \arrow[dr] & \\ \frac{7}{10} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{50} \\ & \textcircled{x5} \arrow[ur] & \end{tikzcd}$$

(h)

$$\begin{tikzcd} & \textcircled{x5} \arrow[dr] & \\ \frac{7}{20} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{100} \\ & \textcircled{x5} \arrow[ur] & \end{tikzcd}$$

(i)

$$\begin{tikzcd} & \textcircled{x5} \arrow[dr] & \\ \frac{2}{3} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{15} \\ & \textcircled{x5} \arrow[ur] & \end{tikzcd}$$

(j)

$$\begin{tikzcd} & \textcircled{x20} \arrow[dr] & \\ \frac{4}{5} \arrow[ur] \arrow[dr] & = & \frac{\bigcirc}{100} \\ & \textcircled{x20} \arrow[ur] & \end{tikzcd}$$

2. Fill in the □ in each question.

Example:

$$\begin{tikzcd} & \text{(x2)} \arrow[dr] & \\ \frac{1}{4} \arrow[ur] \arrow[dr] & = & \frac{2}{\square} \\ & \text{(x2)} \arrow[ur] & \end{tikzcd}$$

Solution: 4 x 2 = $\boxed{8}$

Thus: $\frac{1}{4} = \frac{2}{\boxed{8}}$

(a)
$$\begin{tikzcd} & \text{(x5)} \arrow[dr] & \\ \frac{3}{4} \arrow[ur] \arrow[dr] & = & \frac{15}{\square} \\ & \text{(x5)} \arrow[ur] & \end{tikzcd}$$

(b)
$$\begin{tikzcd} & \text{(x5)} \arrow[dr] & \\ \frac{4}{5} \arrow[ur] \arrow[dr] & = & \frac{20}{\square} \\ & \text{(x5)} \arrow[ur] & \end{tikzcd}$$

(c)
$$\begin{tikzcd} & \text{(x10)} \arrow[dr] & \\ \frac{1}{10} \arrow[ur] \arrow[dr] & = & \frac{10}{\square} \\ & \text{(x10)} \arrow[ur] & \end{tikzcd}$$

(d)
$$\begin{tikzcd} & \text{(x5)} \arrow[dr] & \\ \frac{2}{5} \arrow[ur] \arrow[dr] & = & \frac{10}{\square} \\ & \text{(x5)} \arrow[ur] & \end{tikzcd}$$

(e)
$$\begin{tikzcd} & \text{(x20)} \arrow[dr] & \\ \frac{1}{2} \arrow[ur] \arrow[dr] & = & \frac{20}{\square} \\ & \text{(x20)} \arrow[ur] & \end{tikzcd}$$

(f)
$$\begin{tikzcd} & \text{(x2)} \arrow[dr] & \\ \frac{11}{25} \arrow[ur] \arrow[dr] & = & \frac{22}{\square} \\ & \text{(x2)} \arrow[ur] & \end{tikzcd}$$

(g)
$$\begin{tikzcd} & \text{(x40)} \arrow[dr] & \\ \frac{1}{2} \arrow[ur] \arrow[dr] & = & \frac{40}{\square} \\ & \text{(x40)} \arrow[ur] & \end{tikzcd}$$

(h)
$$\begin{tikzcd} & \text{(x10)} \arrow[dr] & \\ \frac{1}{4} \arrow[ur] \arrow[dr] & = & \frac{10}{\square} \\ & \text{(x10)} \arrow[ur] & \end{tikzcd}$$

(i)
$$\begin{tikzcd} & \text{(x50)} \arrow[dr] & \\ \frac{1}{2} \arrow[ur] \arrow[dr] & = & \frac{50}{\square} \\ & \text{(x50)} \arrow[ur] & \end{tikzcd}$$

(j)
$$\begin{tikzcd} & \text{(x5)} \arrow[dr] & \\ \frac{1}{4} \arrow[ur] \arrow[dr] & = & \frac{5}{\square} \\ & \text{(x5)} \arrow[ur] & \end{tikzcd}$$

3. Fill in the $\triangle$ in each question:

Example 1:

$$\underset{\times 25}{\overset{\times 25}{\frac{3}{4} = \frac{\triangle}{100}}}$$

Solution: $3 \times 25 = 75$

Thus: $\frac{3}{4} = \frac{\boxed{75}}{100}$

Example 2:

$$\underset{\times 20}{\overset{\times 20}{\frac{4}{5} = \frac{80}{\triangle}}}$$

Solution: $5 \times 20 = 100$

$\frac{4}{5} = \frac{80}{\overset{\triangle}{100}}$

(a) $$\underset{\times 2}{\overset{\times 2}{\frac{3}{5} = \frac{\triangle}{10}}}$$

(b) $$\underset{\times 2}{\overset{\times 2}{\frac{4}{25} = \frac{8}{\triangle}}}$$

(c) $$\underset{\times 10}{\overset{\times 10}{\frac{1}{2} = \frac{10}{\triangle}}}$$

(d) $$\underset{\times 2}{\overset{\times 2}{\frac{1}{50} = \frac{\triangle}{100}}}$$

(e) $$\underset{\times 4}{\overset{\times 4}{\frac{2}{5} = \frac{8}{\triangle}}}$$

(f) $$\underset{\times 10}{\overset{\times 10}{\frac{1}{4} = \frac{\triangle}{40}}}$$

(g) $$\underset{\times 7}{\overset{\times 7}{\frac{10}{50} = \frac{\triangle}{350}}}$$

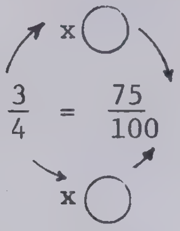
(h) $$\underset{\times 5}{\overset{\times 5}{\frac{2}{20} = \frac{10}{\triangle}}}$$

(i) $$\underset{\times 10}{\overset{\times 10}{\frac{1}{10} = \frac{\triangle}{100}}}$$

(j) $$\underset{\times 5}{\overset{\times 5}{\frac{3}{2} = \frac{15}{\triangle}}}$$

4. Fill in the ○ for each question.

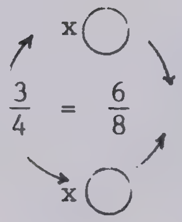
Example:

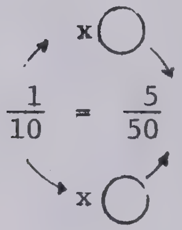


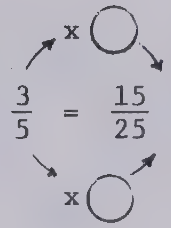
Solution: 3 x ○ = 75

3 x ㉕ = 75

Check: Does 4 x ○ = 100? Yes. So 25 must be the answer.

(a)


(b)


(c)


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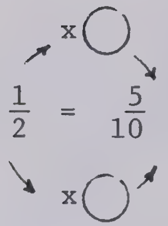
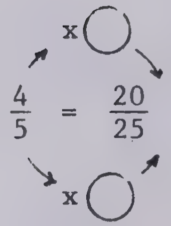
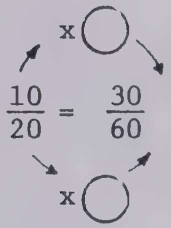
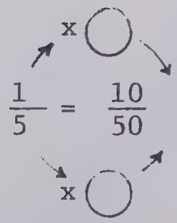
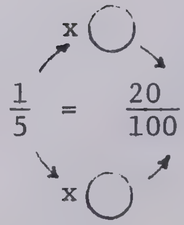
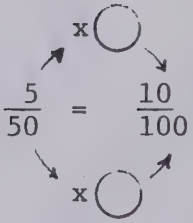


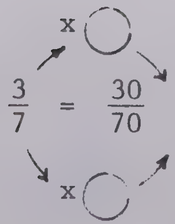
(e)


(f)


(g)


(h)


(i)


(j)


5. Find the numerator in each of the following:

HINT

What number is 10 multiplied by to get 100?

Example: $\frac{3}{10} = \frac{\_\_\_}{100}$

Solution: Since 10 x 10 = 100
then 3 must also be
multiplied by 10, so
the missing number must be 3 x 10 = 30

(a) $\frac{9}{10} = \frac{\_\_\_}{100}$

(b) $\frac{51}{100} = \frac{\_\_\_}{100}$

(c) $\frac{3}{5} = \frac{\_\_\_}{100}$

(d) $\frac{17}{20} = \frac{\_\_\_}{100}$

(e) $\frac{3}{2} = \frac{\_\_\_}{100}$

(f) $\frac{20}{50} = \frac{\_\_\_}{100}$

(g) $\frac{6}{10} = \frac{\_\_\_}{100}$

(h) $\frac{1}{4} = \frac{\_\_\_}{100}$

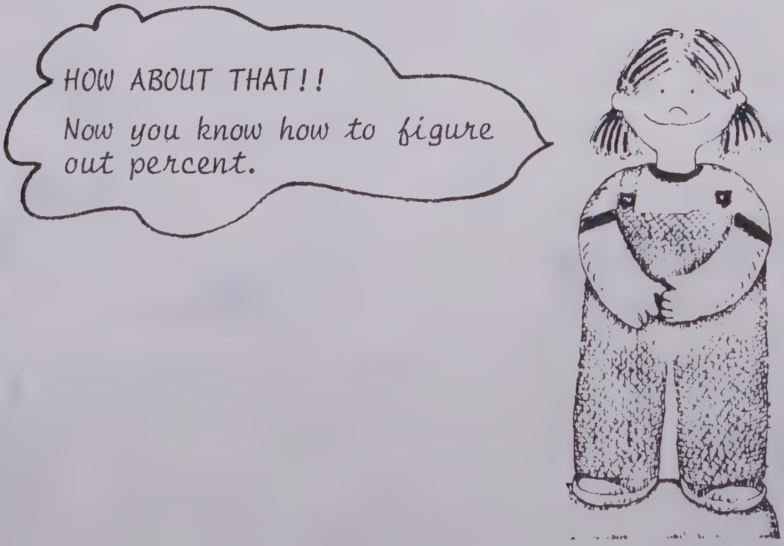
(i) $\frac{15}{25} = \frac{\_\_\_}{100}$

(j) $\frac{1}{2} = \frac{\_\_\_}{100}$

6. After correcting questions 1 to 5, make a fraction showing the number these that you got correct out of 10 for each question.

Now write each of these fractions so that the denominators are 100 instead of 10.

The numerator of each new fraction is the same as your percent for each question.


HOW ABOUT THAT!!
Now you know how to figure out percent.

"TWO-UP"

Materials: Manila Tag

Method:

1. Have each student cut off ten 2" x 3" cards from the manila tag.
2. Using 2 cards at a time, each student puts a fraction on one card, and its equivalent fraction on the second card. e.g. 1/2 and 5/10
3. Each student should end up with five pairs of equivalent cards.

Rules:

1. Two players put their cards together and shuffle them. (20 cards in all)
2. The cards are then placed face down on the desk or table.
3. Each player takes turns in turning up any two cards.
4. If the two cards are equivalent, the player who turned them up keeps them and scores 1 point.
5. To keep score, keep a tally of the points. Highest score wins.

Variation: "PERCENT - UP"

Instead of putting equivalent fractions on the card pairs, put fractions or decimals and their equivalent percent on the cards. Otherwise, play the same.

SHOPPING TRIP MATHEMATICS

1. By studying the diagrams and information find a rate that can be expressed in the form $\frac{a}{b}$.

Example 1:

EVAPORATED MILK
PACIFIC
16 ounce net weight tins. .... **SPECIAL** **2 for 59¢**

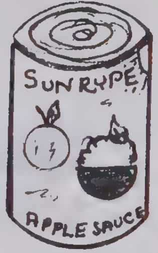
This milk sells at a rate of $\frac{2 \text{ cans}}{59 \text{ cents}}$

or we could also say, $\frac{59 \text{ cents}}{2 \text{ cans}}$

Think - each rate question can be expressed in two ways.

Example 2:

APPLE SAUCE
SUNRYPE,
CANADA FANCY
Red Label.
14 fluid ounce tins. **3 for 99¢**



Applesauce sells at a rate of

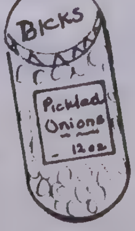
$\frac{3 \text{ cans}}{99 \text{ cents}}$ Or $\frac{99 \text{ cents}}{3 \text{ cans}}$

Notice.. The units (cans and cents) must be included in the rate.

(a)

$\text{Rate} = \frac{? \text{ jars}}{? \text{ cents}}$

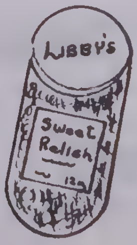
FRESH PACK ONIONS
BICKS
12 ounce jars......................... **Each 83¢**



(b)

$\text{Rate} = \frac{? \text{ cents}}{? \text{ jars}}$

RELISH LIBBY'S
Hot Dog, Hamburger, Sweet.
12 ounce jars.......................... **2 for 95¢**



1. (cont'd.) ***ENJOY FRESH PRODUCE***

(c) **Celery** Canada No. 1 lb. 29¢ Rate = ____________

(d) **Cucumbers** Canada No. 1 2 for 49¢ Rate = ____________

(e) **Oranges** Sunkist Valencias Size 56s 10 for $\$1^{00}$ Rate = ____________

(f) **Potatoes** Canada No. 2 Netted Gems 20 lb. bag $\$1^{25}$ Rate = ____________

(g) **Apples** Canada Fancy Winesaps 4 lb. $\$1^{00}$ Rate = ____________

(h) **Cauliflower** Canada No. 1 Size 16s lb. 49¢ Rate = ____________

You many use 1 dollar or 100 cents for the cost in question 1(e).

2.

(a) **Lipton's Soup** Chicken Noodle Mix 4½ oz. twin pack 2 for 89¢ Rate = ___packages/cents or ___cents/packa

(b) **Toilet Tissue** Silk Assorted Colors 4 roll pkg. 79¢ Rate = _____ or _____

(c) **Lemonade** Minute Maid Regular or Pink Frozen Concentrate 6 fl. oz. tin 4 for 95¢ Rate = _____ or _____

(d) **Margarine** Blue Bonnet Colored 3 lb. pkg. $\$1^{89}$ Rate = _____ or _____

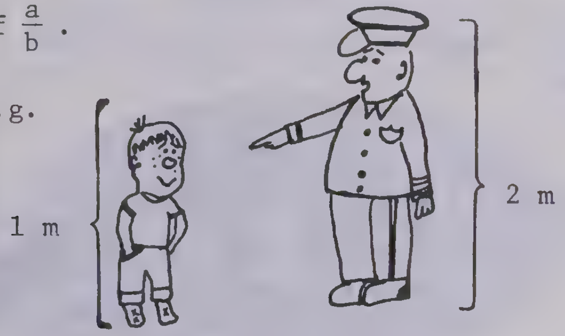
(e) **Chocolates** Black Magic 1 lb. box $\$2^{29}$ Rate = _____ or _____

(f) **Dad's Cookies** Oatmeal 32 oz. pkg. $\$1^{77}$ Rate = _____ or _____

(g) **Spaghetti** Taste Tells In Tomato Sauce with Cheese 14 fl. oz. tin 3 for 89¢ Rate = _____ or _____

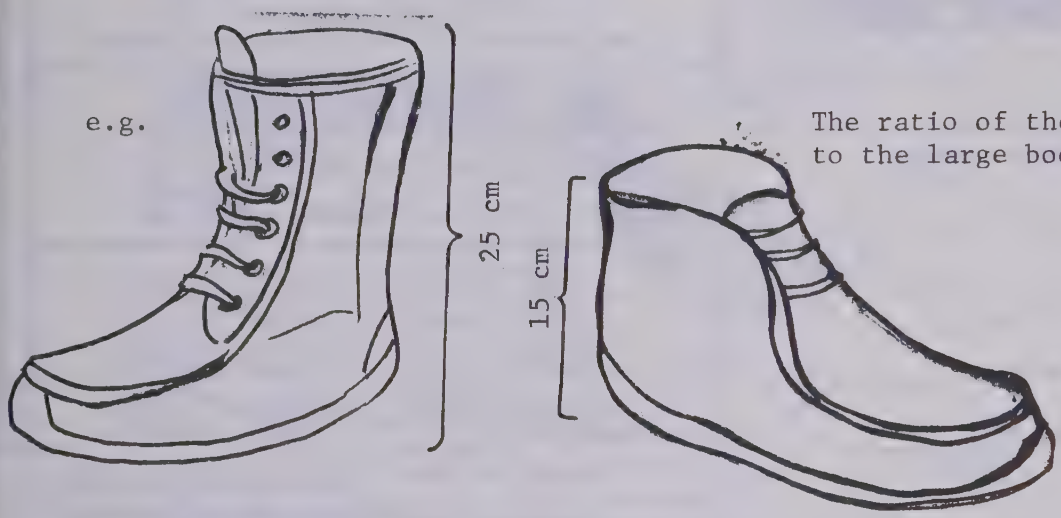
3. By studying the diagram find a ratio that can be expressed in the form of $\frac{a}{b}$.

e.g.

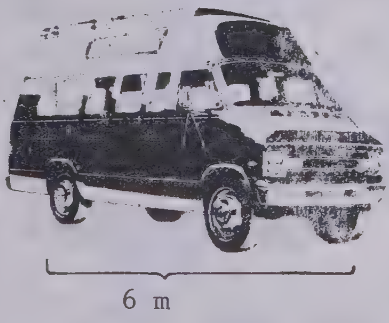


The ratio of the boy's height to the policeman's height is $\frac{1}{2}$, or we may say the ratio of the policeman's height to the boy's height is $\frac{2}{1}$.

e.g.



The ratio of the small boot to the large boot is $\frac{15}{25}$.



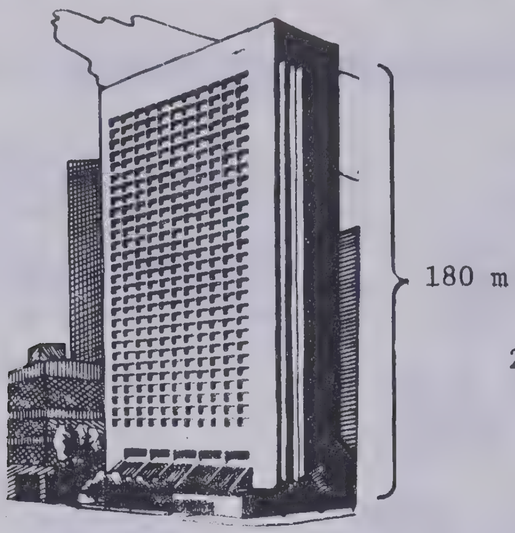
length　　　　　width

(a) Ratio = __________ or Ratio = ______________

width　　　　　length

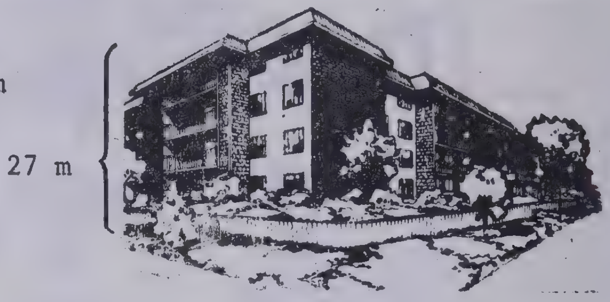
(b) Ratio = __________ or Ratio = ______________

3. (c)



Ratio = __________ or

Ratio = __________



(d) Find the ratio of the cost of each 1974 vehicle to the cost of each 1973 vehicle.

Spring Sale

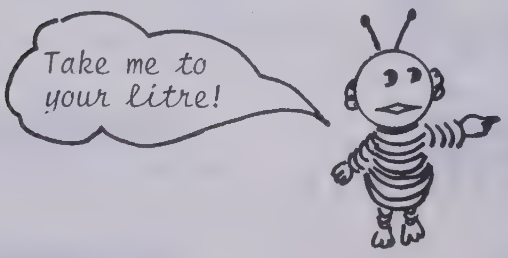
1974 CHEV 1/2 ton, V8 auto., p.s.	$3,995
1974 FORD 1/2 ton, V8 4 spd.	$3,895
1974 CHEV 3/4 ton, V8 at.	$4,295
1973 FORD 3/4 ton, 6 cyl,. 4 spd.	$2,495
1973 FORD 3/4 ton, 4 x 4	$3,995

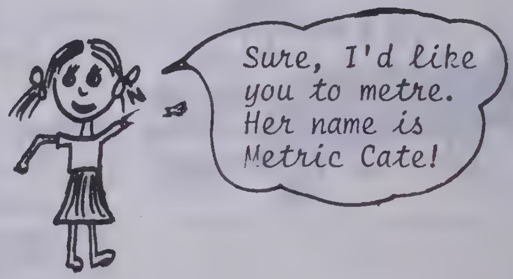
(i) Ratio = ______ (ii) Ratio = ______ (iii) Ratio = ______

(iv) Ratio = ______ (v) Ratio = ______ (vi) Ratio = ______

(e) Find a ratio comparing the number of words each person spoke.

Ratio = __________


Take me to your litre!


Sure, I'd like you to metre. Her name is Metric Cate!

(f) Find as many ratios as possible comparing the amounts of different Ingredients of cole slaw. (There are 12 in all.)

COLE SLAW

3 cups (750 ml)	of cabbage
1 cup (250 ml)	grated carrot
1/2 cup (125 ml)	raisins
1/2 cup (125 ml)	mayonnaise

Toss ingredients together and chill.

4. Rich with Ratios

By carefully studying the advertisement, find as many ratios of sale prices to regular prices as you can. By studying the ratios, try to decide which item from Sentry Wholesale is the best buy.

Buy direct from
SENTRY
MAKE 100% PROFITS!

The Nation's Most Complete Wholesale Source
For Tape and Accessories
DEALER'S ORDER FORM—FILL IN COUPON—USE ENTIRE PAGE

8 TRACK STEREO TAPES

WE'RE DIRECT DISTRIBUTORS FOR AMPEX, RCA, CAPITOL, COLUMBIA, ETC. — GUARANTEED QUALITY. EVERY TAPE DIRECT FROM THE MANUFACTURER.
(WHY NOT PAY A LITTLE MORE — AND BE SURE!)

NO REPRODUCTIONS — ALL ORIGINALS!— MAJOR LABELS

12 Tapes, **1.75 Ea.** 8 Tr. ☐ or Cassette ☐ **21.00**
25 Tapes, **1.60 Ea.** 8 Tr. ☐ or Cassette ☐ **40.00**
50 Tapes, **1.50 Ea.** 8 Tr. ☐ or Cassette ☐ **75.00**
100 Tapes, **1.40 Ea.** 8 Tr. ☐ or Cassette ☐ **140.00**
1000 Tapes. **1.35 Ea.** 8 Tr. ☐ or Cassette ☐ **1350.00**

Check Category: Country & Western Mixed Pack ___ Rock-Mixed Pack ___ Soul Mixed Pack ___ Adult Party Mixed Pack ___ General Ass't Mixed Pack ___ Easy Listening Mixed Pack
Shipping & Handling 10¢ per tape.

EXTRA — ATTRACTIVE COUNTER DISPLAY — Available upon request, only for 8 Track Cartridge in units of 50 Ass'd. Cartridges.

ROBIN TAPE PLAYERS AND RECORDERS BELOW WHOLESALE!

a. **8 TRACK CAR STEREO**
Heavy Duty, Sliding volume and tone control, rotary balance control. Channel indicator, attractive design
Reg. 39.^{50} **26^{50}** 6 for 147.00
Shipping — 1.50 per unit

b. **CASSETTE CAR STEREO**
Easy play and reject button, playback system
Reg. 49.^{50} **34^{50}** 6 for 199.00
Shipping — 1.50 per unit

FLUSH MOUNT CHROME SPEAKER SET
5 Watt, 8 Ohm, Model KM-2018
7.00 per set
Shipping — 75¢ each set

WEDGE SPEAKER SET
5 Watt, 8 Ohm, Model KB-2
6.00 per set
Shipping — 75¢ each set

c. **STEREO 8 TRACK TAPE DECK**
Wood cabinet, complete with 2 cables — to attach to your home amplifier.
Model SS 1000
Reg. 44.^{50} **27^{00}** Shipping — 2.00 per unit

d. **PORTABLE CASSETTE TAPE RECORDER**
Rotary switch control, automatic level control, battery operated.
Model 8000 DC
Reg. 34.^{50} **19^{75}** Shipping — 1.50

e. solar Model 46F8
COMBINATION AM/FM 8-TRACK, STEREO PORTABLE PLAYER/RADIO
- Sturdy one piece design with built-in AC/DC
- 10 Watts responsive power
- Automatic Track changer
- Sliding volume and tone controls
- Convenient carry handle and telescope antenna

reg. 69.95 SPECIAL **48^{95}** Shipping & Handling 3.00

NS CALCULATORS
Fits in your shirt pocket! Solves any math problem in seconds.

Model NS 650
- 6 digit readout • Automatic squaring; LED display
- Add, subtract, multiply, divide • 9V batt. included
- Fixed 2 place decimal • For home, office, school, salesman

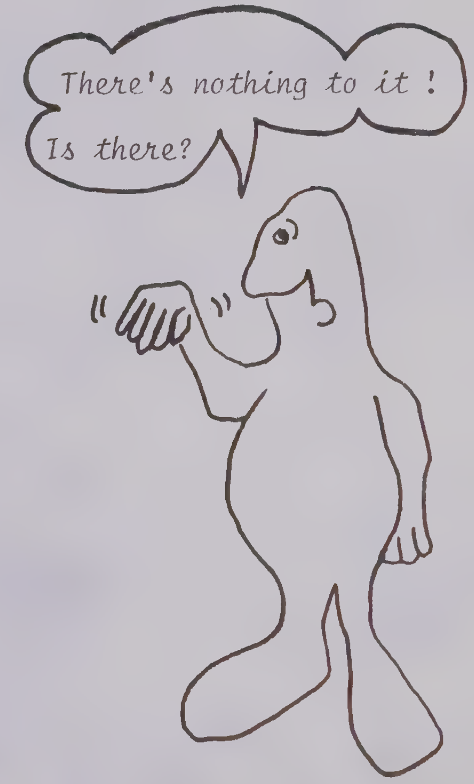
14^{95}

Model NS 850
Same as above with 8 digit; floating decimal; algebraic logic; all clear and clear entry key. **17^{95}**

Model NS 826
- 8 digit readout with storage memory
- Algebraic logic, add, subtract, multiply, divide
- Floating decimal, percentage constant key
- Automatic shut off, LED display • Batteries included

24^{95}

AC adapter, all models 5.95. Vinyl carry case (specify model) 1.95.
Shipping & Handling 1.00 per unit


There's nothing to it ! Is there?

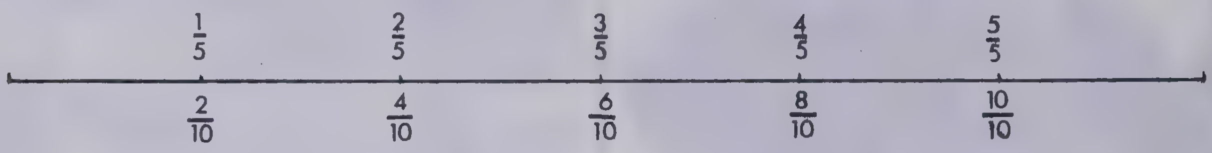
f. **HOME STEREO SPEAKER SYSTEMS**
Walnut finished, "super performing" pair of stereo speakers with built-in horn diffusor for wide range coverage in handsome vinyl wrapped wood veneer exterior. Special
Model 1501
Size: 16"x10"x5"
17^{50} pr.
reg. 27.95 pr.

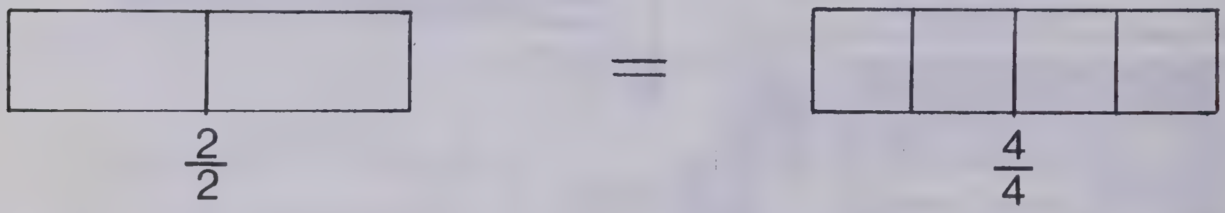
g. **STEREO HEADPHONES**
Amazing value and amazing sound. With flexible head band; adjustable white ear pads; and long 6 ft. cord.
Model 5208
reg. 6.95 SPECIAL **3^{75}**

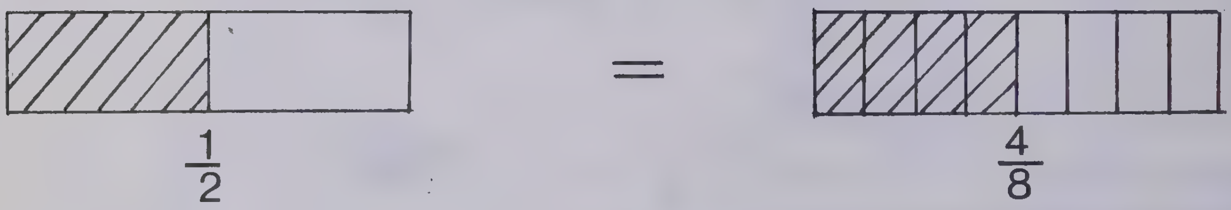
h. **SUPER-SPECIAL**
PORTABLE AM POCKET-SIZE RADIO
With wrist strap, magnetic ear phone, battery— plus super sound. handsome designer case.
Reg. 6.50 **SPECIAL 3.25 EA 6 FOR 18.00**
Shipping & Handling 50¢

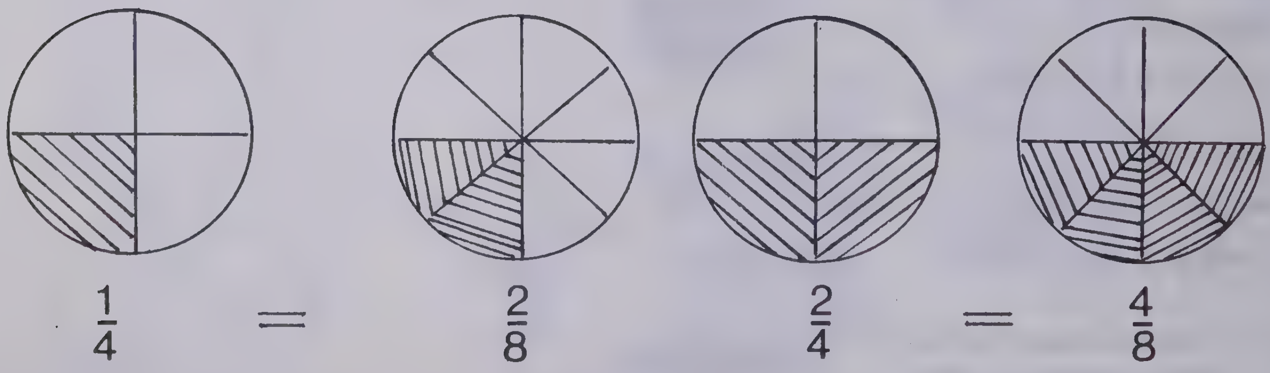
Equivalence:

Carefully consider the diagrams of equivalent fractions below and describe why they are equivalent.









NOTE:

Fractions are changed to equivalent fractions by either multiplying both the numerator and denominator by the same number or by dividing both the numerator and denominator by the same number.

Example: Find an equivalent fraction to $\frac{5}{10}$

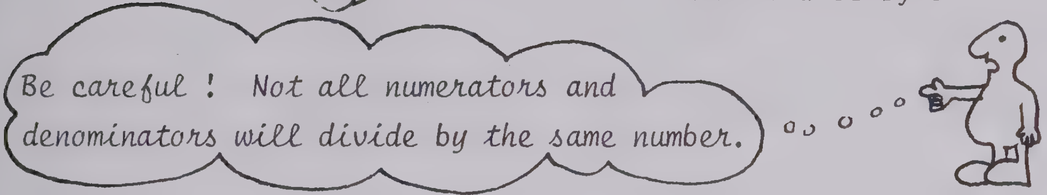
Solution:

$$\frac{5}{10} \underset{\times 3}{\overset{\times 3}{=}} \frac{15}{30}$$

Multiply numerator and denominator by 3.

Also: $\frac{5}{10} \underset{\div 5}{\overset{\div 5}{=}} \frac{1}{2}$

Divide both numerator and denominator by 5


Be careful ! Not all numerators and denominators will divide by the same number.

Exercise: Find the missing part of each fraction below by either multiplying or dividing both numerator and denominator of one of the fractions to get the other equivalent fraction.

1. a. $\frac{2}{2} = \frac{x}{4}$

b. $\frac{1}{2} = \frac{x}{8}$

c. $\frac{5}{10} = \frac{1}{x}$

d. $\frac{13}{25} = \frac{x}{50}$

e. $\frac{x}{20} = \frac{3}{4}$

f. $\frac{1}{4} = \frac{x}{8}$

g. $\frac{2}{4} = \frac{4}{x}$

h. $\frac{9}{18} = \frac{x}{2}$

i. $\frac{4}{12} = \frac{x}{3}$

j. $\frac{2}{3} = \frac{x}{21}$

k. $\frac{3}{6} = \frac{x}{12}$

l. $\frac{5}{10} = \frac{x}{2}$

m. $\frac{5}{7} = \frac{x}{14}$

n. $\frac{8}{9} = \frac{16}{x}$

o. $\frac{x}{16} = \frac{1}{4}$

p. $\frac{8}{25} = \frac{x}{50}$

q. $\frac{3}{5} = \frac{x}{15}$

KEY TO EXERCISES

LEVEL 7

UNIT IV

RATE, RATIO & PERCENT

KEY TO EXERCISES

Objective No. 1

1. a. 5 b. 5 c. 30 d. 30 e. 20
   f. 2 g. 35 h. 35 i. 10 j. 80

2. a. 20 b. 25 c. 100 d. 25 e. 40
   f. 50 g. 80 h. 40 i. 100 j. 20

3. a. 6 b. 50 c. 20 d. 2 e. 20
   f. 10 g. 70 h. 100 i. 10 j. 10

4. a. 2 b. 5 c. 5 d. 5 e. 5
   f. 3 g. 10 h. 20 i. 2 j. 10

5. a. 90 b. 51 c. 60 d. 85 e. 150
   f. 40 g. 60 h. 25 i. 60 j. 50

Objective No. 2

1. a. $\frac{1}{83}$

   b. $\frac{95}{2}$

   c. $\frac{\text{29 cents}}{\text{1 lb.}}$ or $\frac{\text{1 lb.}}{\text{29 cents}}$

   d. $\frac{\text{49 cents}}{\text{2 cucumbers}}$ or $\frac{\text{2 cucumbers}}{\text{49 cents}}$

   e. $\frac{\text{1 dollar}}{\text{10 oranges}}$ or $\frac{\text{100 cents}}{\text{10 oranges}}$ or $\frac{\text{10 oranges}}{\text{100 cents}}$ or $\frac{\text{10 oranges}}{\text{1 dollar}}$

   f. $\frac{\text{1.25 dollars}}{\text{20 lbs.}}$ or $\frac{\text{20 lbs}}{\text{1.25 dollars}}$

   g. $\frac{\text{1 dollar}}{\text{4 lbs.}}$ or $\frac{\text{4 lb.}}{\text{1 dollar}}$

   h. $\frac{\text{49 cents}}{\text{1 lb.}}$ or $\frac{\text{1 lb.}}{\text{49 cents}}$

Key to Exercises

Objective No. 2 (cont'd)

2. a. $\frac{2}{89}$ or $\frac{89}{2}$

b. $\frac{\text{4 Rolls}}{\text{79 cents}}$ or $\frac{\text{79 cents}}{\text{4 rolls}}$

c. $\frac{\text{4 tins}}{\text{95 cents}}$ or $\frac{\text{95 cents}}{\text{4 tins}}$

d. $\frac{\text{3 packages}}{\text{1.89 dollars}}$ or $\frac{\text{1.89 dollars}}{\text{3 packages}}$

e. $\frac{\text{1 box}}{\text{2.29 dollars}}$ or $\frac{\text{2.29 dollars}}{\text{1 box}}$

f. $\frac{\text{1 package}}{\text{1.77 dollars}}$ or $\frac{\text{1.77 dollars}}{\text{1 package}}$

g. $\frac{\text{3 tins}}{\text{89 cents}}$ or $\frac{\text{89 cents}}{\text{3 tins}}$

3. a. $\frac{15}{25}$ or $\frac{25}{15}$

b. $\frac{88}{12}$ or $\frac{12}{8}$

c. $\frac{180}{27}$ or $\frac{27}{180}$

d. (i) $\frac{3\ 995}{2\ 495}$ (ii) $\frac{3\ 995}{3\ 995}$ (iii) $\frac{3\ 895}{2\ 495}$ (iv) $\frac{3\ 895}{3\ 995}$ (v) $\frac{4\ 295}{2\ 495}$ (vi) $\frac{4\ 295}{3\ 995}$

e. $\frac{2}{7}$ or $\frac{7}{2}$

f. $\frac{3}{1}$, $\frac{3}{\frac{1}{2}}$, $\frac{1}{3}$, $\frac{1}{\frac{1}{2}}$, $\frac{\frac{1}{2}}{1}$, $\frac{\frac{1}{2}}{3}$, $\frac{\frac{1}{2}}{\frac{1}{4}}$, $\frac{3}{\frac{1}{4}}$, $\frac{1}{\frac{1}{4}}$, $\frac{\frac{1}{4}}{\frac{1}{2}}$, $\frac{\frac{1}{4}}{3}$, $\frac{\frac{1}{4}}{1}$

4. a. $\frac{26.50}{39.40}$ b. $\frac{34.50}{49.50}$ c. $\frac{27}{44.50}$ d. $\frac{19.75}{34.50}$

e. $\frac{48.95}{69.95}$ f. $\frac{17.50}{27.95}$ g. $\frac{3.75}{6.95}$ h. $\frac{3.25}{6.50}$

Objective No. 3

a. 4 b. 4 c. 2 d. 26 e. 15 f. 2 g. 8

h. 1 i. 1 j. 14 k. 6 l. 1 m. 10 n. 18

o. 4 p. 16 q. 9

MEASUREMENT

LEVEL 7

UNIT V

CONTENTS

Unit V - Measurement

PAGE

OBJECTIVE 1: Explain measurement as a comparison to some unit. .... 175.

OBJECTIVE 3: Express measurements correctly by including the numeral and unit. .... 179.

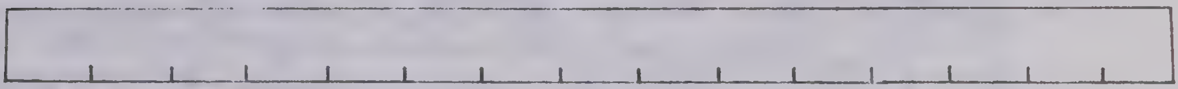
OBJECTIVE 5: Convert SI units of length from one unit to another. (Limit: mm, cm, m, km). .... 184.

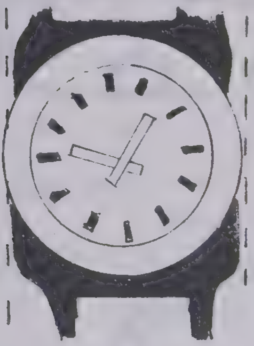
OBJECTIVE 6: Measure objects accurately using the SI units of length. (Limit : mm, cm, m). .... 189.

OBJECTIVE 8. Perform operations of addition and subtraction with SI units of measure. .... 193.

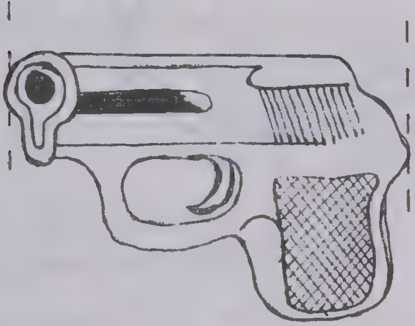
KEY TO EXERCISES .... 194.

A. Find the length of each of the objects shown. Cut out the ruler on the right and use it as shown in the examples.



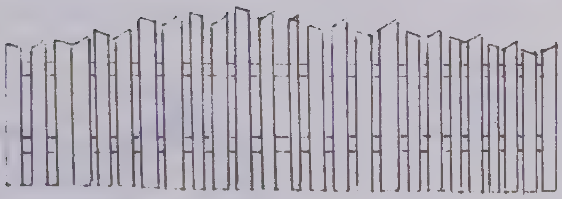
1. 

The watch is 3 units wide.

2. 

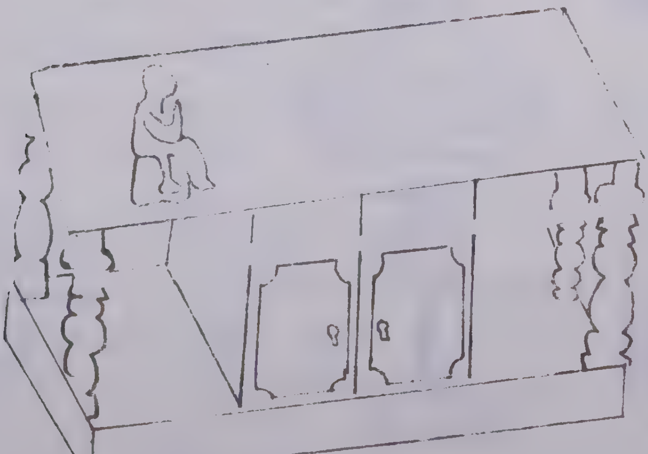
The gun is 5 units long.

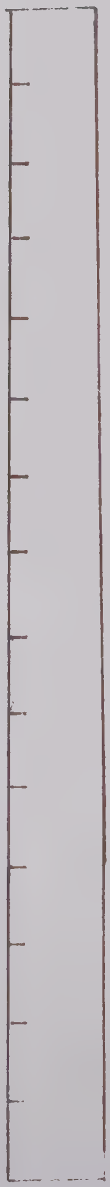
The gate is ___ units long.

3. 

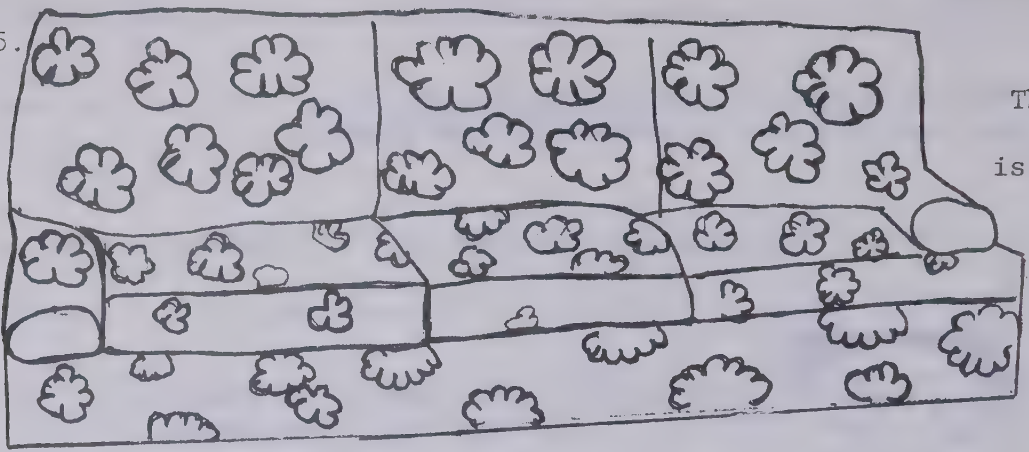
The coffee table is

___ units long.

4. 



5.



The chesterfi

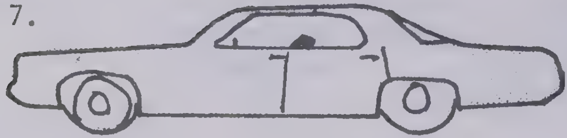
is ___ units l

6.

The shoe sole is

___ units long.

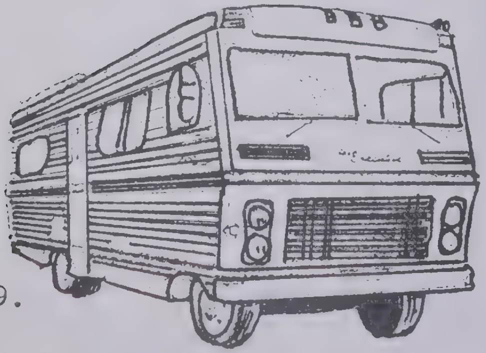
7.



8. The brush is

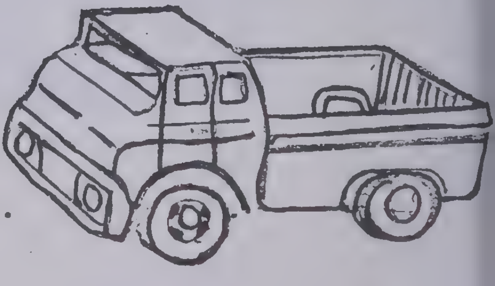
___ units across

The car is ___ units long.



9.

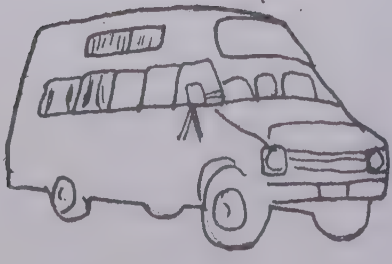
____ units



10.

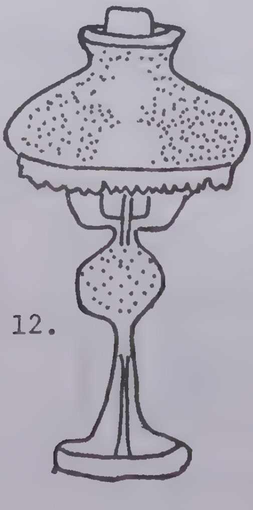
___ units

11.



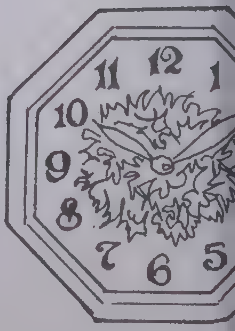
___ units

12.



_____ units

13.



_____ units

Class Activity

B. Find the measurement of each of the objects in the table and record your results in the space provided. Use the length of a chalk brush as the unit of length.

	ANSWER
HEIGHT OF CLASSROOM DOOR	
WIDTH OF CLASSROOM DOOR	
LENGTH OF BLACKBOARD	
WIDTH OF BLACKBOARD	
LENGTH OF YOUR DESK TOP	

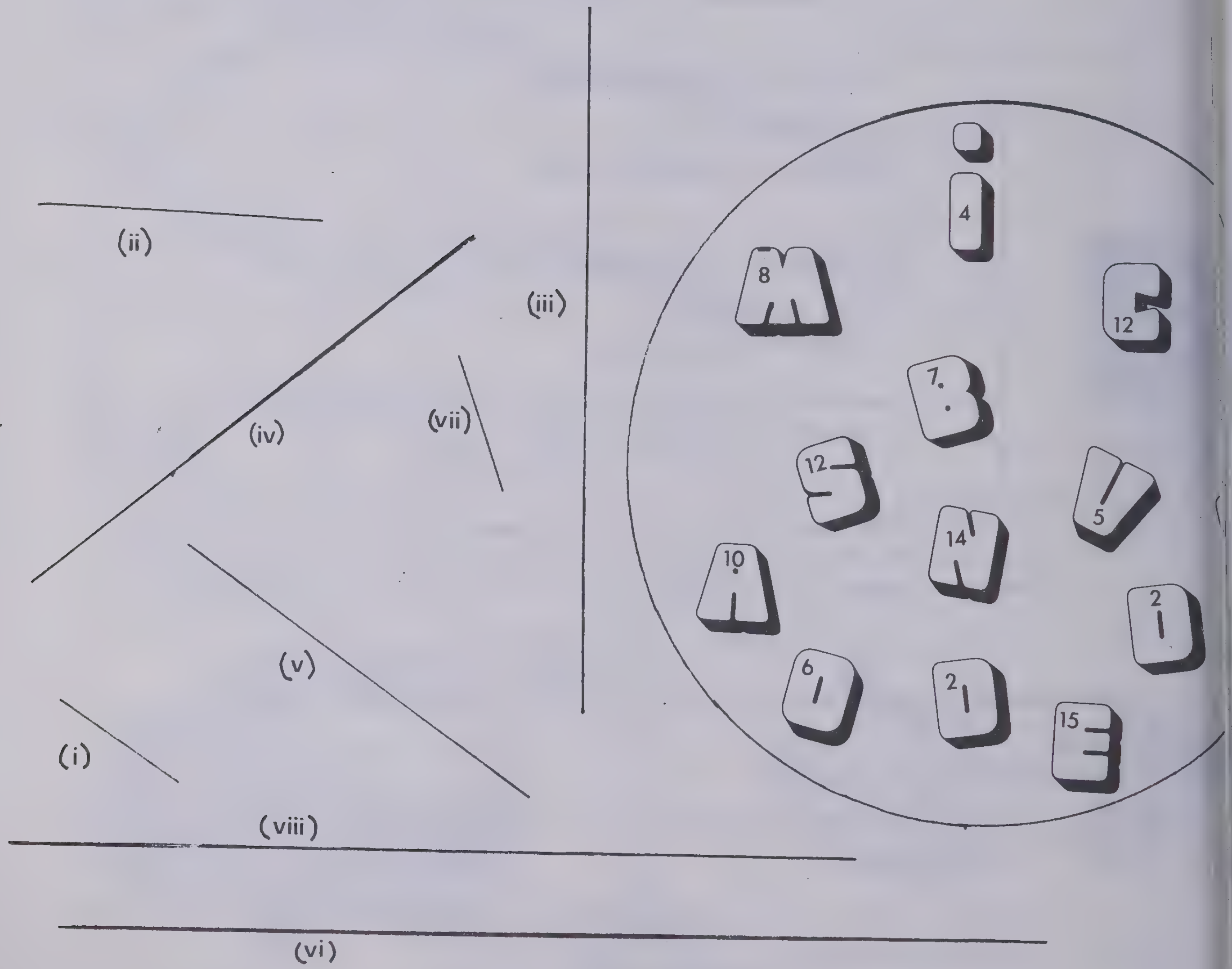
C. Now that you have some practice in measuring, first estimate the measurement of the objects and then find the exact measurement. Use the length of your Math text as the unit of measurement.

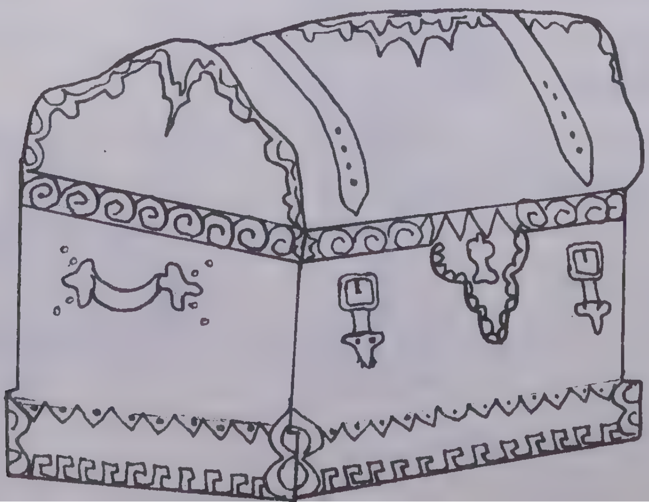
	ESTIMATE	EXACT ANSWER
LENGTH OF ROOM		
WIDTH OF ROOM		
LENGTH OF WINDOW		
WIDTH OF WINDOW		
LENGTH OF TEACHER'S DESK		
YOUR OWN HEIGHT		

D.

Treasure Measure

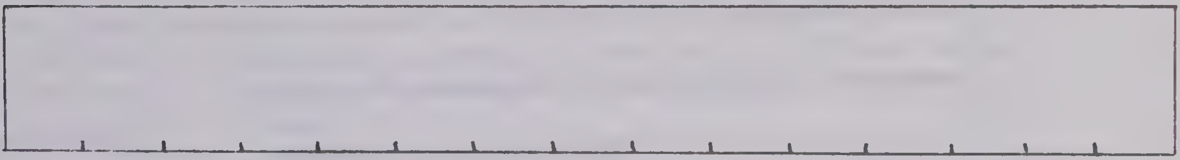
To find what is in the Treasure Chest below, measure each segment and find the letter in the circle with the measure of each segment. Write this letter just above the segment number in the Treasure Che
The unit of measure is the centimetre.



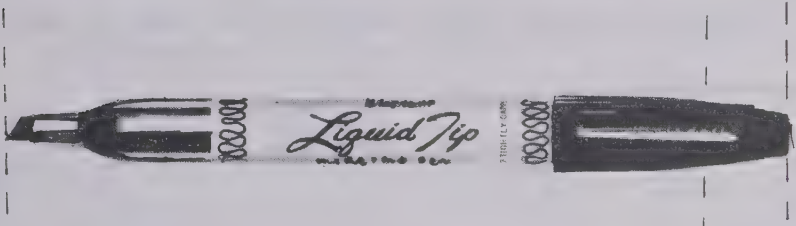


___ ___ ___ ___ ___ ___ ___
i ii iii iv v vi vii

How long is each object? Each space on the ruler below is one "unit" long. Count the number of units in each and write your answer in the space provided.

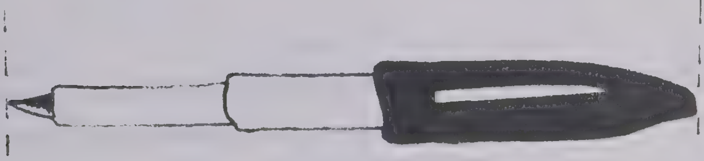


1.



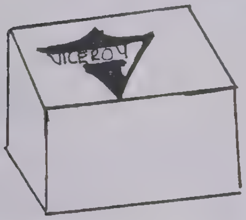
____ units

2.



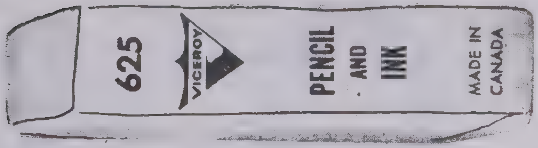
____ units

3.



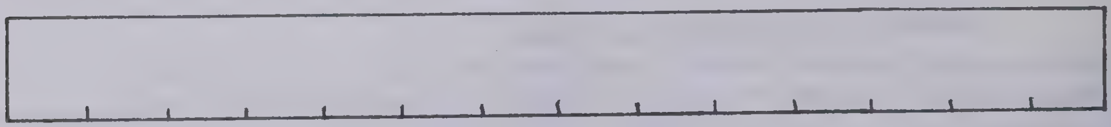
____ units

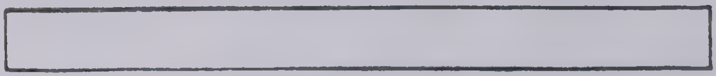
4.

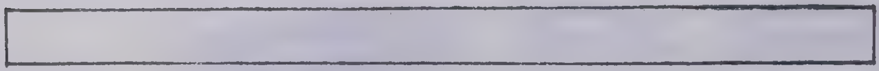


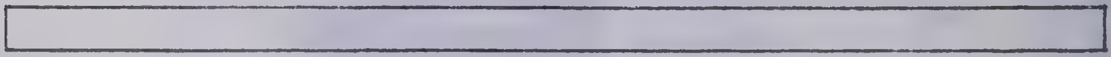
____ units

The word "units" is not usually written. The measure below is in centimetre units. Give the length of each bar in centimetres.

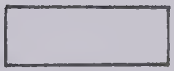


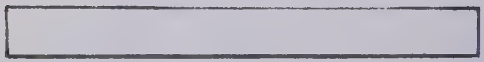
1.  _____ centimetres

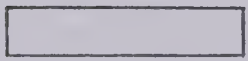
2.  _____ centimet

3. 

_____ centimetres

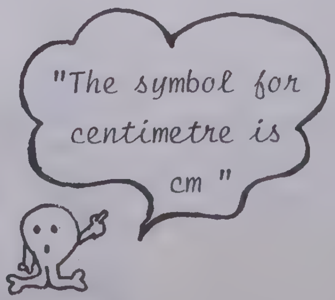
4.  _____ centimetres

5.  _____ centimetres

6.  _____ centimetres

Measure the width of your little finger with a centimetre ruler. Is it close to one centimetre wide? List other things around you that are "close" to one centimetre in length.

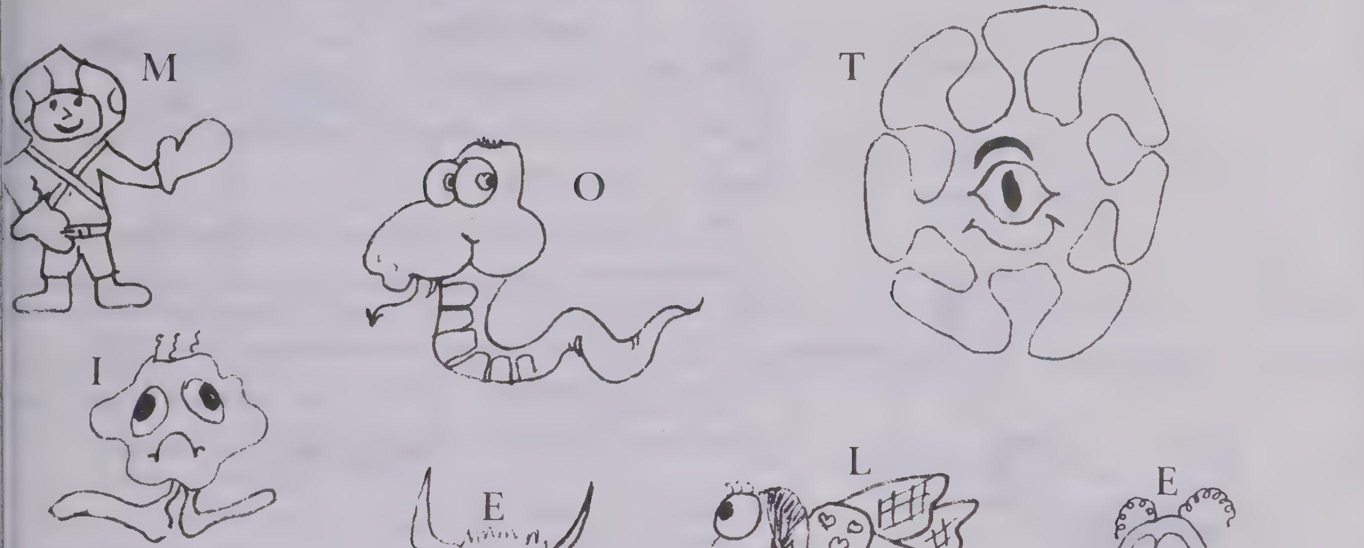
1. _______________
2. _______________
3. _______________
4. _______________
5. _______________

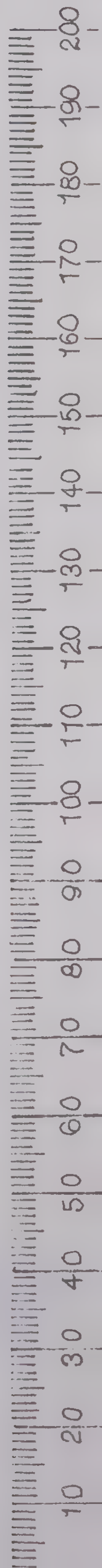

"The symbol for centimetre is cm"

"METRIFY"

As we change to the metric system of measure old proverbs will change also. To "metrify" the proverb below, perform these simple steps:

1. Measure the height of Astronaut Albert and his friends using the unit of measure on the right. This is the millimetre. The symbol is mm .
2. Match the letter beside each character with the closest measure below.





"There was a crooked man and he walked a crooked

_____ _____ _____ _____ _____ _____ _____ _____ _____ ."

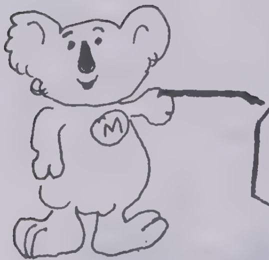
32 mm 27 mm 25 mm 30 mm 35 mm 57 mm 45 mm 63 mm 69 mm

Hi there, I am a metric spy working for the SI system. Our job is to overthrow the British system. If you want to become a memb of our organization, you are going to have t learn our secret code. It is as follows:

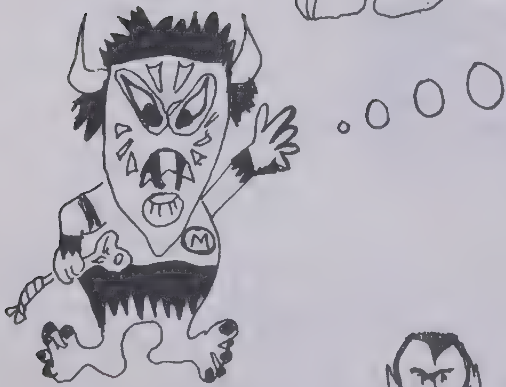
*	1.	millimetre	mm
*	2.	centimetre	cm
*	3.	decimetre	dm
*	4.	metre	m
	5.	dekametre	dam
	6.	hectometre	hm
*	7.	kilometre	km

P.S. - We are going to work with the ones wit the *'s.

My fellow spys will give you some more valuab information involving our secret organization



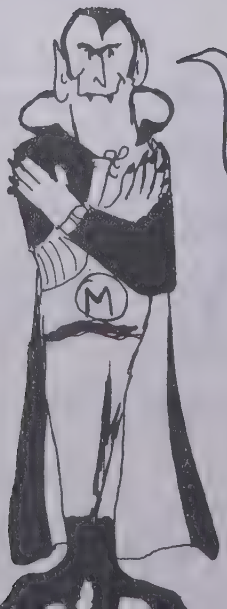
First, the METRE. It is the standard unit in the metric for the measurement of length.



It's about time we talked about the tiny measu in the metric system. It is the millimetre.

TOP SECRET ---- milli means $\frac{1}{1\ 000}$ so --

a milli --- metre is $\frac{1}{1\ 000}$ of a metre.

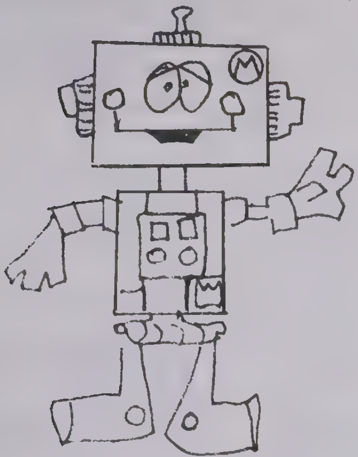


Now for the delicious centimetre. It is 10 times larger than the millimetre.

TOP SECRET ---- centi means $\frac{1}{100}$ so

a centi---metre is

$\frac{1}{100}$ of a metre.



Do you know about the decimetre? It is 10 times larger than the centimetre.

TOP SECRET -- deci -- means $\frac{1}{10}$ so a

deci---metre is $\frac{1}{10}$ of a metre.

I say, there, the largest unit in the metric system is the kilometre.

TOP SECRET -- kilo means 1 000 so a

kilo---metre is
1 000 times a metre.

NOW IT'S TIME TO SEE IF YOU QUALIFY AS A METRIC SPY FOR THE METRIC SYSTEM. ANSWER THE FOLLOWING QUESTIONS.

1. If 1 mm = $\frac{1}{1\ 000}$ m, then ___ mm = 1 m.
2. If 1 cm = $\frac{1}{100}$ m, then ___ cm = 1 m.
3. If 1 dm = $\frac{1}{10}$ m, then ___ dm = 1 m.
4. If 1 m = $\frac{1}{1\ 000}$ km, then ___ m = 1 km.
5. If i mm = $\frac{1}{10}$ cm, then ___ mm = 1 cm.
6. If 1 cm = $\frac{1}{10}$ dm, then ___ cm = 1 dm.
7. If 1 dm = $\frac{1}{10}$m, then ___ dm = 1 m.

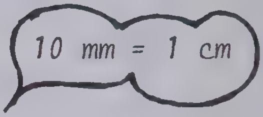
IF YOU HAVE PASSED, PUT YOUR SIGNATURE HERE ______________________________
(Official Metric Spy Signature)

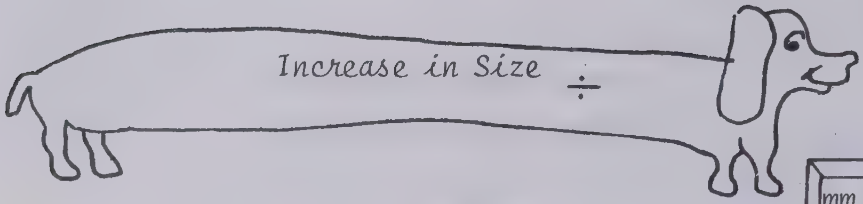
OATH OF ALL METRIC SPYS

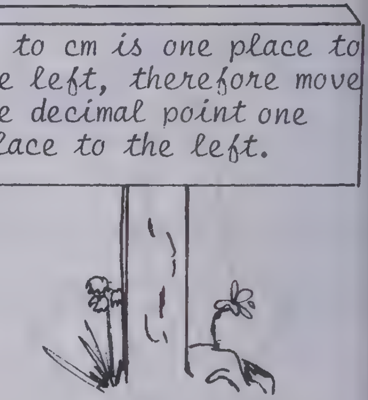
I, ____________________ promise to do everything in my power to help the metric system overthrow the British system in Canada.

Example 1 :

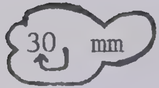
30 mm = _____ cm






mm to cm is one place to the left, therefore move the decimal point one place to the left.

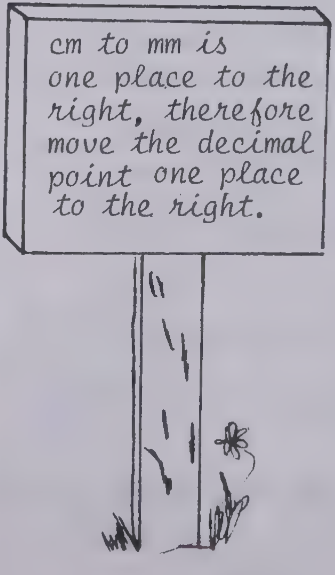
m dm cm mm



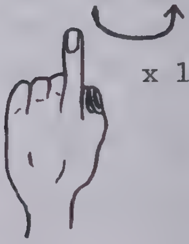
30 mm ÷ 10 = 3 cm

Example 2:

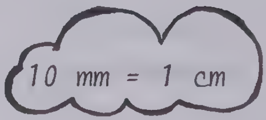
30 cm = ______ mm


cm to mm is one place to the right, therefore move the decimal point one place to the right.

m dm cm mm



x 10



1. 10 mm = _____ cm
2. 20 mm = _____ cm
3. 50 mm = _____ cm
4. 80 mm = _____ cm
5. 100 mm = _____ cm

6. 10 cm = _____ mm
7. 20 cm = _____ mm
8. 50 cm = _____ mm
9. 80 cm = _____ mm
10. 100 cm = _____ mm

Remember
10 mm = 1 cm

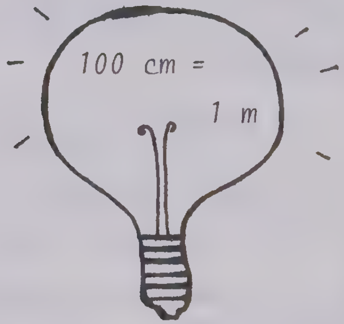
Increase in size, ÷

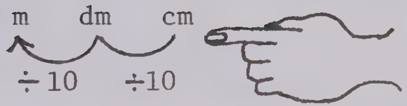
Decrease in size, x

Example 3:

300 cm = ____ m

300 ÷ 100 = 3 m



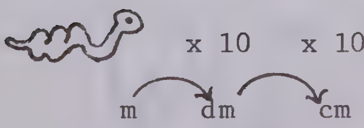


2 places to the left, move the decimal two places to the left.

Example 4:

300 m = _____ cm

300 x 100 = 30 000 cm



2 places to the right, move the decimal two places to the right

1. 100 cm = ___ m
2. 200 cm = ___ m
3. 500 cm = ___ m
4. 3 000 cm = ___ m
5. 70 000 cm = ___ m

6. 10 m = ____ cm
7. 300 m = ____ cm
8. 50 m = ____ cm
9. 7 m = ____ cm
10. 800 m = ____ cm

100 cm = 1 m

Increase in size, ÷
Decrease in size, ×

Example 5:

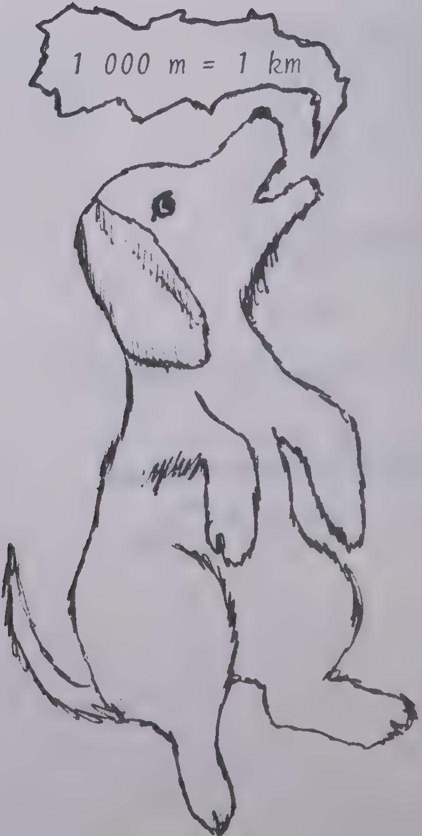
2 000 m = ____ km

2 000   1 000 = 2 km

km hm dam m dm cm mm

÷ 10 ÷10 ÷10

m to km is a move of 3 places, therefore, move the decimal point 3 spaces to the left.



1. 3 000 m = ____ km
2. 15 000 m = ____ km
3. 100 000 m = ____ km
4. 75 000 m = ____ km
5. 950 000 m = ____ km

Example 6:

5 km = _____ m

5 x (1 000) = 5 000 m

1 000 m = 1 km

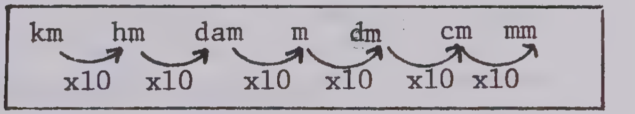
km hm dam m dm cm mm

x10 x10 x10

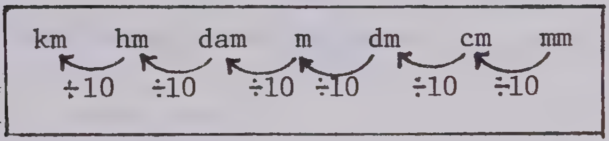
Decreasing in size, you must multiply

1. 2 km = ___ m
2. 7 km = ___ m
3. 17 km = ____ m
4. 25 km = ___ m
5. 290 km = ____m

DECREASE IN SIZE



INCREASE IN SIZE



Let's Try Some

1. 100 mm = _____ cm
2. 600 mm = _____ cm
3. 40 cm = _____ m
4. 700 cm = _____ m
5. 8 000 m = _____ km
6. 9 000 m = _____ km
7. 27 000 m = _____km
8. 900 cm = _____ m
9. 1 000 mm = _____ cm
10. 10 000 000 cm = ______ m
11. 20 cm = _____ mm
12. 60 cm = _____ mm
13. 4 m = _____ cm
14. 40 m = _____ cm
15. 8 km = _____ m
16. 24 km = _____ m
17. 4 800 m = _____ cm
18. 1 km = _____ mm
19. 10 m = _____ cm
20. 20 m = _____ mm

CRACK THE CODE

1. Place the correct number in each blank below.
2. Match the number with the letter at the left.
3. Place the letter in its proper place in the code at the bottom of the page.

A: 30 cm = ___ mm

C: 2 km = ___ m

S: 300 mm = ___ cm

G: 20 m = ___ cm

N: 6 000 m = ___ km

U: 100 m = ___ km

L: 40 mm = ___ cm

Y: 2 000 m = ___ km

V: 800 cm = ___ mm

B: 20 km = ___ cm

E: 400 mm = ___ cm

D: 17 km = ___ m

H: 600 cm = ___ m

R: 7 000 mm = ___ m

T: 60 mm = ___ cm

V: 400 cm = ___ m

F: 5 km = ___ mm

O: 30 mm = ___ cm

I: 45 000 m = ___ km

J: 80 000 m = ___ km

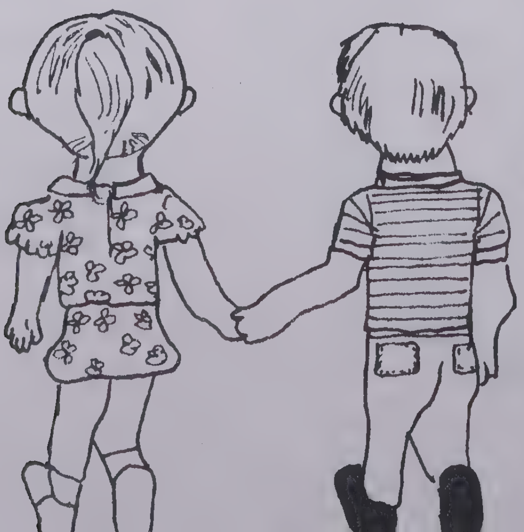
___ ___ ___ ___
4cm 3cm 4m 40cm

___ ___   ___ ___ ___
45km 30cm   6km 3cm 6cm

___ ___ ___ ___ ___ ___   ___ ___   ___ ___ ___
6m 300mm 8000mm 45km 6km 2000cm   6cm 3cm   30cm 300mm 2km

___ ___ ___   ___ ___ ___
2km 3cm 1km   300mm 7m 40cm

___ ___ ___ ___ ___
30cm 3cm 7m 7m 2km



EXERCISE A: Find the following (use a metre stick)

1. With chalk, place a mark on the wall showing how high a person would be if:

   a. he was 1 metre tall
   b. he was 2 metres tall

2. On the floor measure the following distance and find out how many steps it takes you to cover them. NUMBER OF STEPS

   a. 2m ________
   b. 4m ________
   c. 5m ________
   d. 7m ________
   e. 9m ________
   f. 10m ________

3. Find the length of the chalkboard in your room. __________

4. Find the height of the door in your classroom. __________

EXERCISE B: Find the length of the following, in millimetres.

1. Your pen. __________
2. Diameter of a nickel __________
3. Width of your fingernail __________
4. Thickness of a piece of chalk __________
5. Width of this sheet of paper __________
6. Width of your desk __________

EXERCISE C: Find the length of the following in centimetres.

1. Width of your fingernail __________
2. Length of your eraser __________
3. Your pen __________
4. Width of this sheet of paper __________
5. Length of this sheet of paper __________
6. Width of your desk top __________

EXERCISE D: Find the length of the following items in decimetres.

1. Width of your hand ________
2. Length of a chalkbrush ________
3. Width of your desk ________
4. Length of your desk top ________
5. Width of your teacher's desk ________
6. Length of your teacher's desk ________
7. Length of the chalkboard
   in your room ________

Subtract the following measures:

Example: Subtract:
10 m
- 5 m
5 m

1. 67 cm
-40 cm

2. 316 km
-142 km

3. 6.7 cm
-4.6 cm

4. 816 m
-451 m

5. 675 km
-89 km

6. 16 cm - 10 cm =

7. 39.008 km - 12.006 km =

8. 65 cm - 32 cm + 24 cm =

9. 12.05 m
- 6.35 m

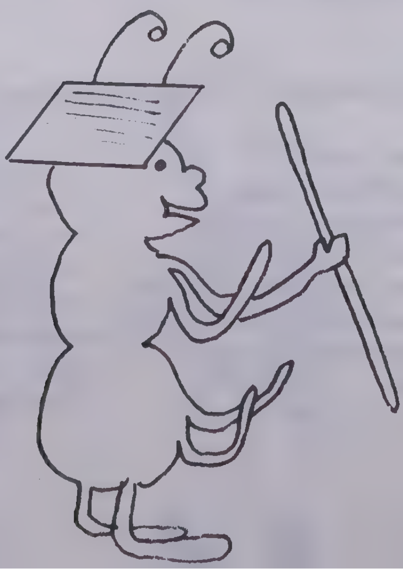
10. 8.9 cm
-6.9 cm

11. 3.0 m
- 2.4 m

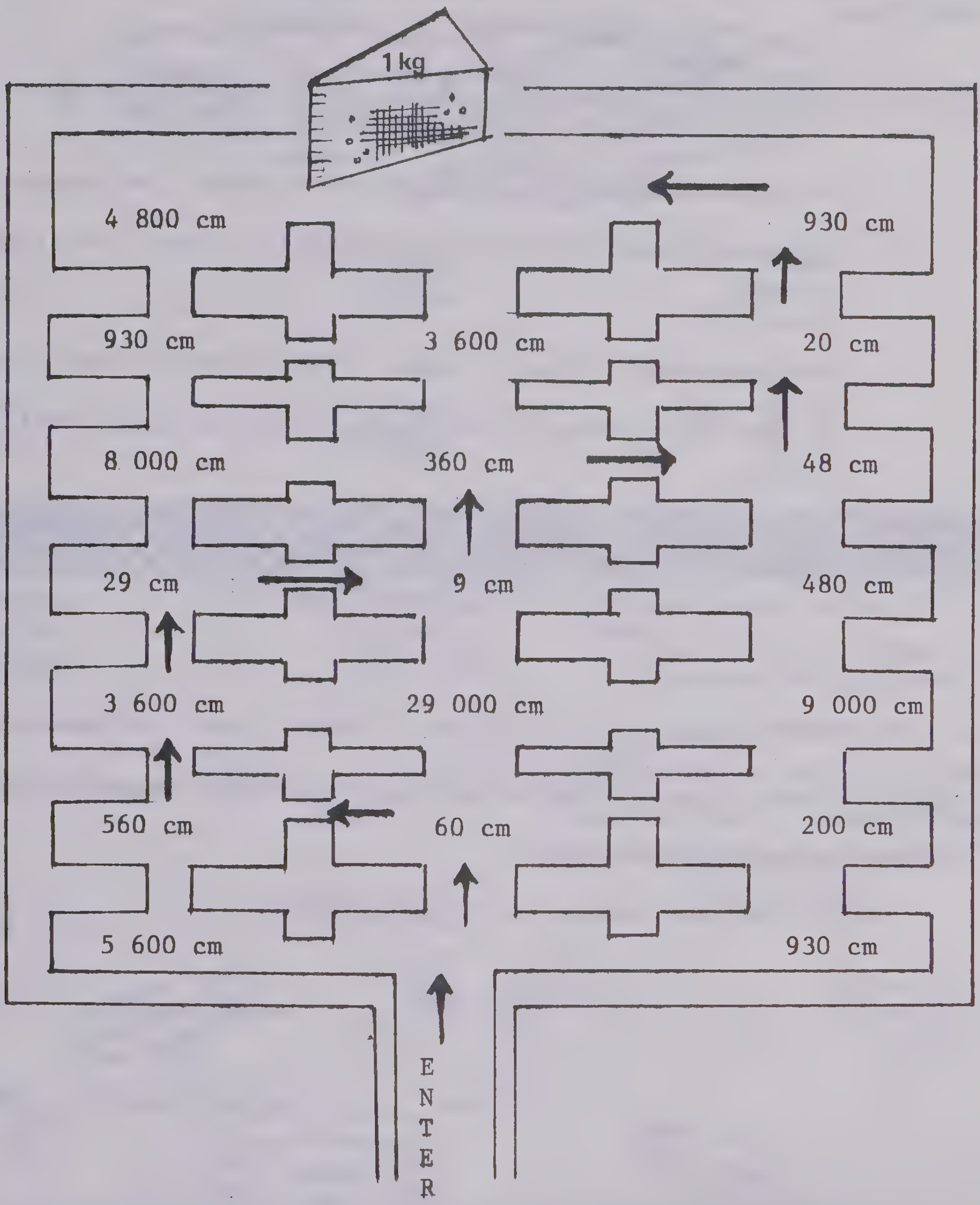
12. 16.14 m
- 2.05 m

13. 36.00 m
-18.62 m

HINT: We can borrow to subtract in metric measure the same as in regular subtraction.

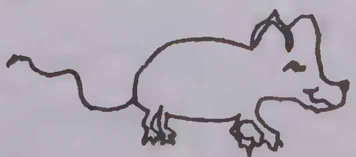


ELDURON THE MOUSE

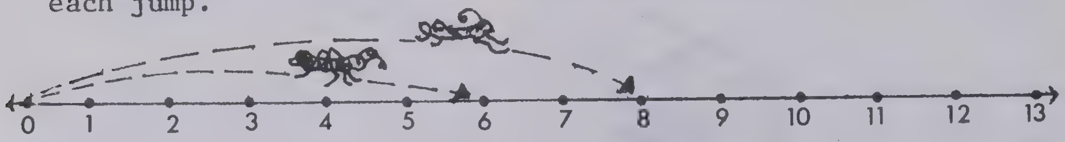


Elduron, the metric mouse, followed the arrows in this maze to get to the treasure which was a kilogram of cheeze. If each of these measures are in centimetres, how far did Elduron have to travel in centimetres?

How far is this in metres?



A grasshopper and a cricket are racing along a metrestick. The grasshopper travels 8 cm each jump. The cricket travels 6 cm each jump.



1. The cricket starts at 0 and makes 10 jumps. He travels ____ cm.
2. The grasshopper starts at 0 and makes 6 jumps. He travels

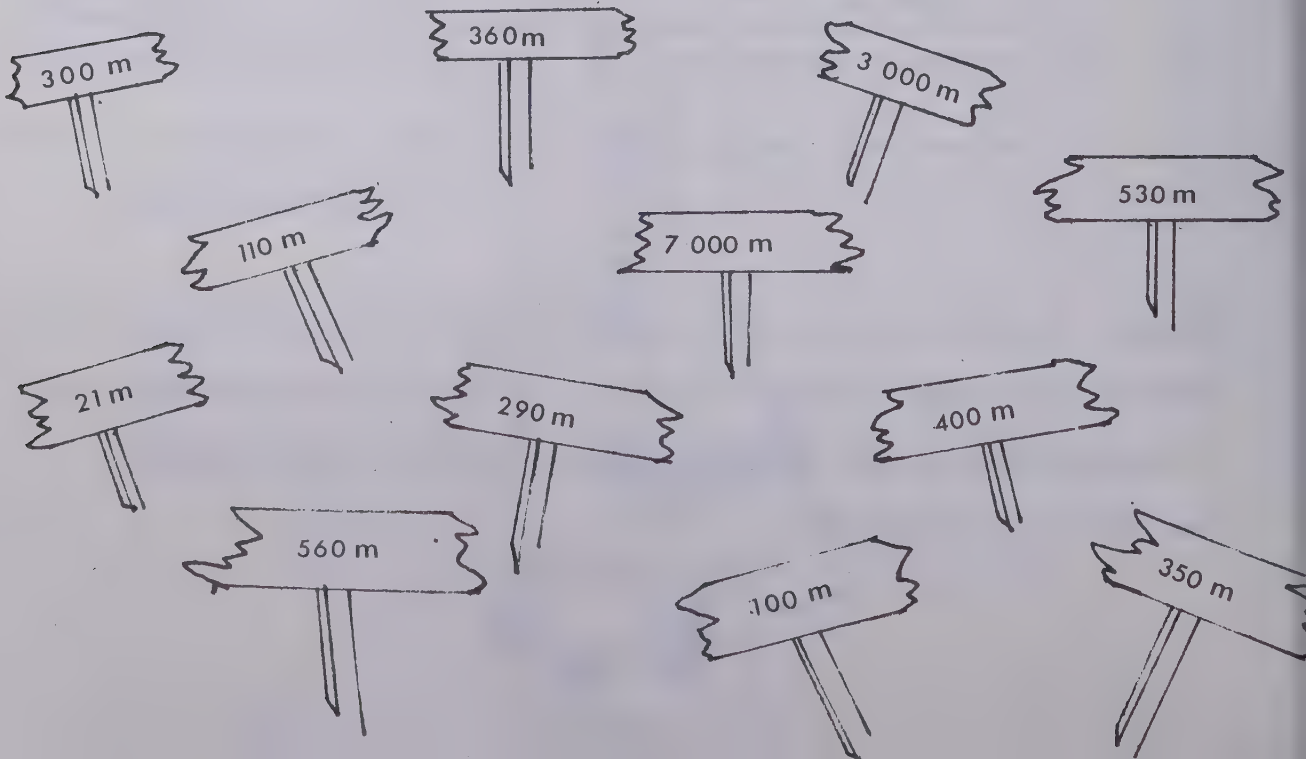
   ______ cm.
3. The grasshopper makes 15 jumps. The cricket makes 15 jumps.

   If they both started together, how far apart are they?

* * *

The HAPPY HILL golf club wishes to build a new 3 kilometre golf course. Choose from the list below those nine signs which would indicate the appropriate course length.

(HINT: How many metres in 3 kilometres?)



Add the following:

Example: $$\begin{array}{r} 6\ \text{cm} \\ +\ 3\ \text{cm} \\ \hline \end{array}$$

Solution: $$\begin{array}{r} 6\ \text{cm} \\ +\ 3\ \text{cm} \\ \hline 9\ \text{cm} \end{array}$$

Remember: Two measures must be with the same group or family to be added or subtracted.

1. $$\begin{array}{r} 4\ \text{m} \\ +7\ \text{m} \\ \hline \end{array}$$

2. $$\begin{array}{r} 14\ \text{m} \\ +21\ \text{m} \\ \hline \end{array}$$

3. $$\begin{array}{r} 30\ \text{km} \\ +100\ \text{km} \\ \hline \end{array}$$

4. $$\begin{array}{r} 89\ \text{mm} \\ +64\ \text{mm} \\ \hline \end{array}$$

5. $$\begin{array}{r} 89\ \text{mm} \\ +948\ \text{mm} \\ \hline \end{array}$$

6. $$\begin{array}{r} 369\ \text{m} \\ 84\ \text{m} \\ +\ 106\ \text{m} \\ \hline \end{array}$$

7. $$\begin{array}{r} 3\ 000\ \text{km} \\ 180\ \text{km} \\ +1\ 214\ \text{km} \\ \hline \end{array}$$

*8. $$\begin{array}{r} 8.006\ \text{km} \\ +\ 4.007\ \text{km} \\ \hline 12.013\ \text{km} \end{array}$$

Do not forget to write the unit of measure !

9. 16 mm + 10 mm + 13 mm =

Decimals in metric measure are the same as normal decimal numerals.

10. 86 m + 12 m + 21 m + 30 m + 180 m =

*11. 22 m + 12 cm + 3 mm = ______ cm

*12. 36 cm + 24 m + 100 mm = ______ mm

**HINT: For questions 11 and 12, remember to convert all the measures to ONE unit.*

KEY TO EXERCISES

LEVEL 9

UNIT V

MEASUREMENT

KEY TO EXERCISES

Objective No 1

A. 3. 7   4. 8   5. 13   6. 11   7. 7

8. 2   9. 6   10. 6   11. 5   12. 3   13. 4

Treasure Measure

"DIAMONDS"

Objective No. 3

1. 10   2. 9   3. 3   4. 7

1. 9   2. 11   3. 14   4. 2   5. 6   6. 3

Metrify

"KILOMETRE"

METRIC SPY TEST

1. 1 000   2. 100   3. 10   4. 1 000

5. 10   6. 10   7. 10

Objective No. 5

1. 1   2. 2   3. 5   4. 8   5. 10

6. 100   7. 500   8. 500   9. 800   10. 1 000

1. 1   2. 2   3. 5   4. 30   5. 700

6. 1 000   7. 30 000   8. 5 000   9. 700   10. 80 000

1. 3   2. 15   3. 100   4. 75   5. 950

1. 2 000   2. 7 000   3. 17 000   4. 25 000   5. 290 000

Objective No. 5 Cont'd

1. 10
2. 60
3. 4
4. 7
5. 8
6. 9
7. 27
8. 9
9. 100
10. 100 000
11. 200
12. 600
13. 400
14. 4 000
15. 8 000
16. 2 400
17. 480 000
18. 1 000 000
19. 1 000
20. 20 000

Crack the Code

"Love is not having to say you are sorry".

Objective No. 6

Subtraction:

1. 27 cm
2. 174 km
3. 2.1 cm
4. 365 m
5. 586 km
6. 6 cm
7. 27.002 km
8. 57 cm
9. 5.7 m
10. 2.0 cm
11. 0.6 m
12. 14.09 m
13. 17.38 m

Elduron the Mouse

5 616 cm ---- 56.16 m or 56 m 16 cm

Happy Hill Golf Course

560m; 100m; 350m; 530m; 400m; 110m; 300m; 360m; 290m;

Objective No. 8

1. 11m
2. 35 m
3. 130 km
4. 153 mm
5. 1 037 mm
6. 559 m
7. 4 394 km
9. 39 mm
10. 329 m
11. 2212.3 cm
12. 24 460 mm

GEOMETRY

LEVEL 7

UNIT VII

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Unit VII Geometry

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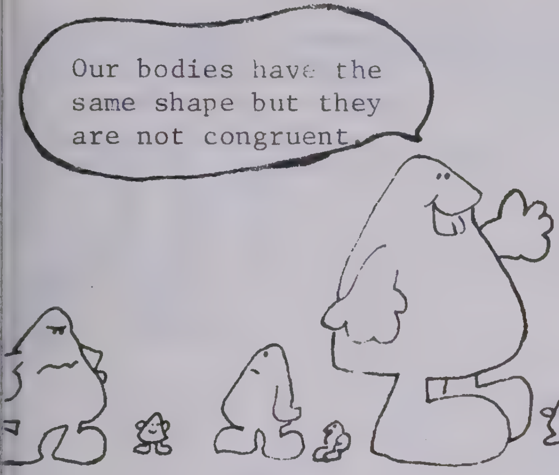
OBJECTIVE 17: Classify polygons. (Limit: triangles, quadrilaterals, pentagons, hexagons, octagons and decagons) .... 209.

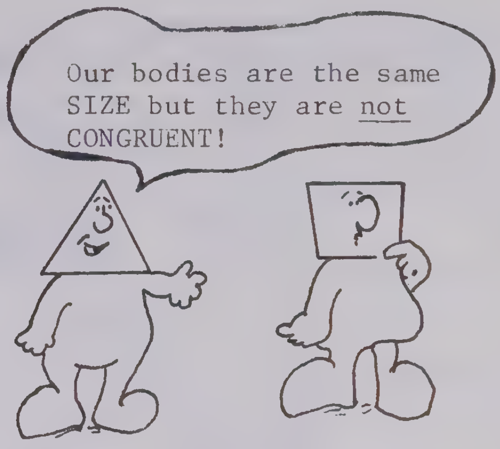
OBJECTIVE 18: Using the number of lines of symmetry classify a triangles by its sides. .... 212.

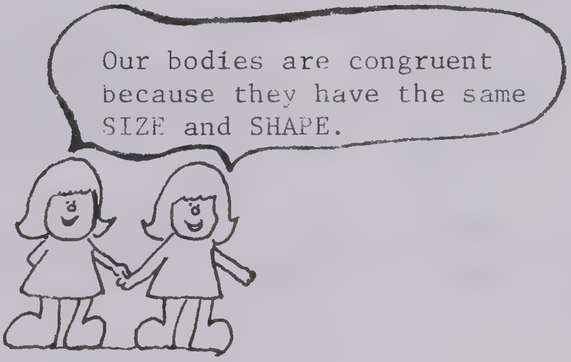
OBJECTIVE 19: Classify quadrilaterals. .... 214.

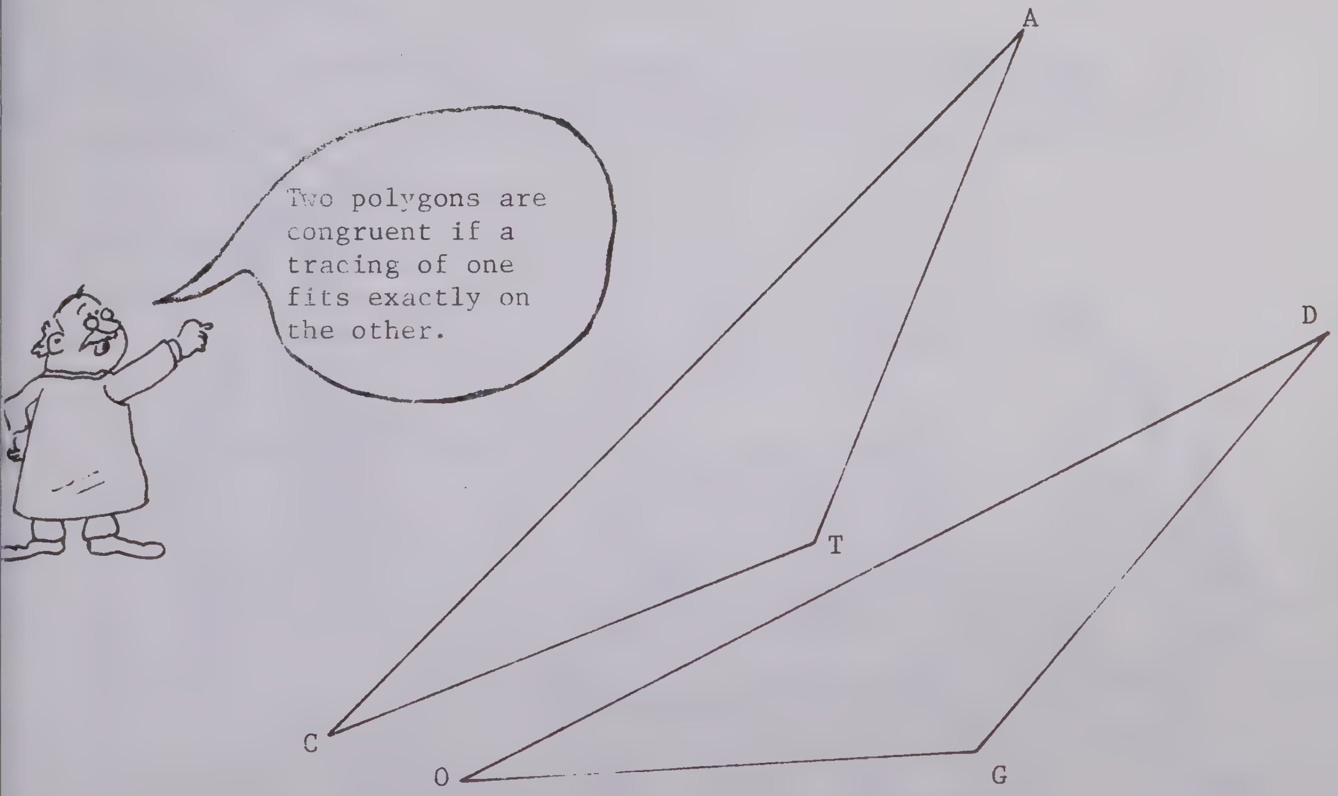
OBJECTIVE 21. Identify the parts of a circle. (Limit: center, radius, diameter, chord, arc, semi-circle, tangent and secant) .... 218.

KEY TO EXERCISES .... 220.


Our bodies have the same shape but they are not congruent.

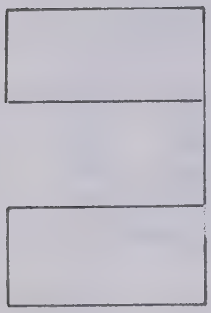

Our bodies are the same SIZE but they are not CONGRUENT!


Our bodies are congruent because they have the same SIZE and SHAPE.


Two polygons are congruent if a tracing of one fits exactly on the other.
A
T
C
D
O
G

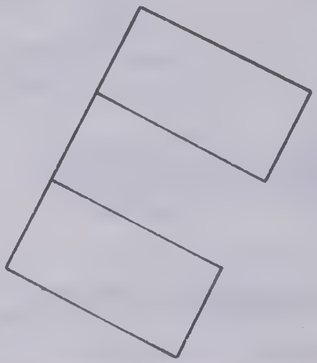
EXERCISES UNIT VII OBJECTIVE NO. 2

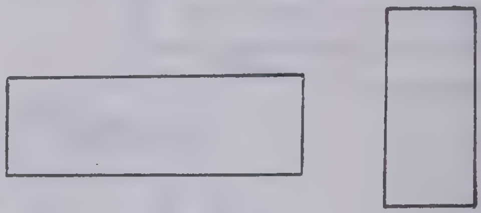
1. Check by tracing which of the following pairs of figures are congruent. Circle the "yes" or "no to indicate your answer.



Yes

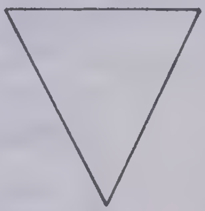
No





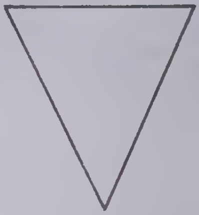
Yes

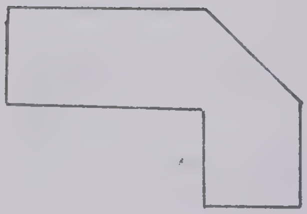
No



Yes

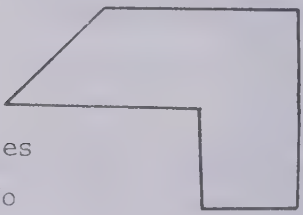
No



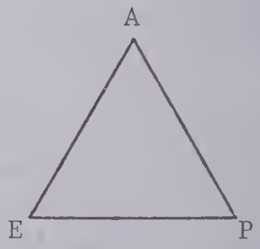


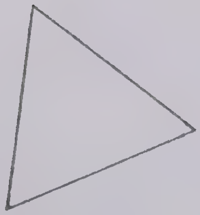
Yes

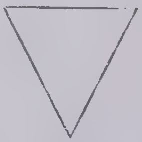
No

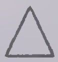


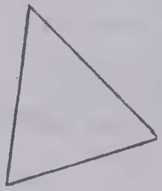
2. In the figures below three are congruent to ΔAPE, shown at the right. Using tracing paper find the three congruent shapes and place a check mark (√) in each.

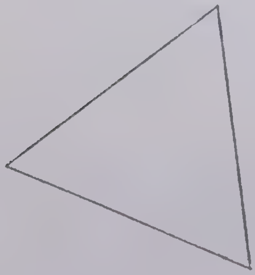


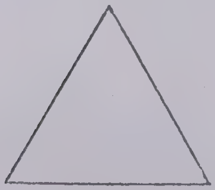


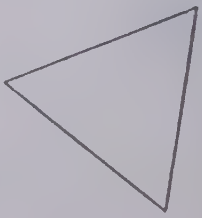


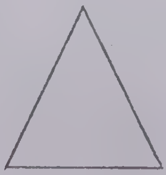


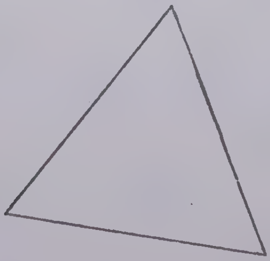


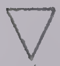


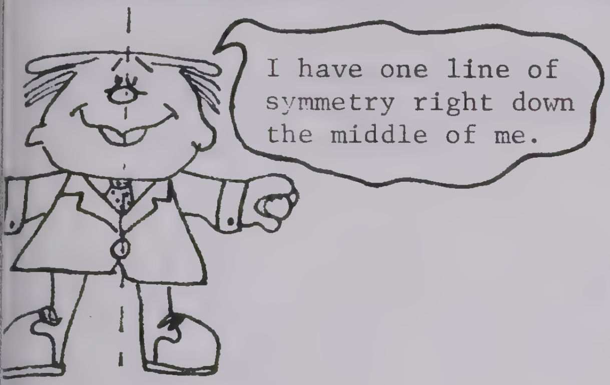


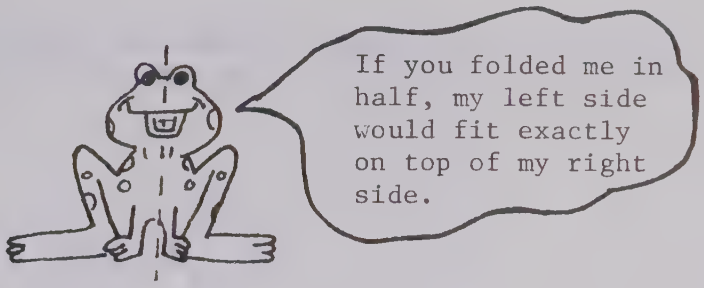


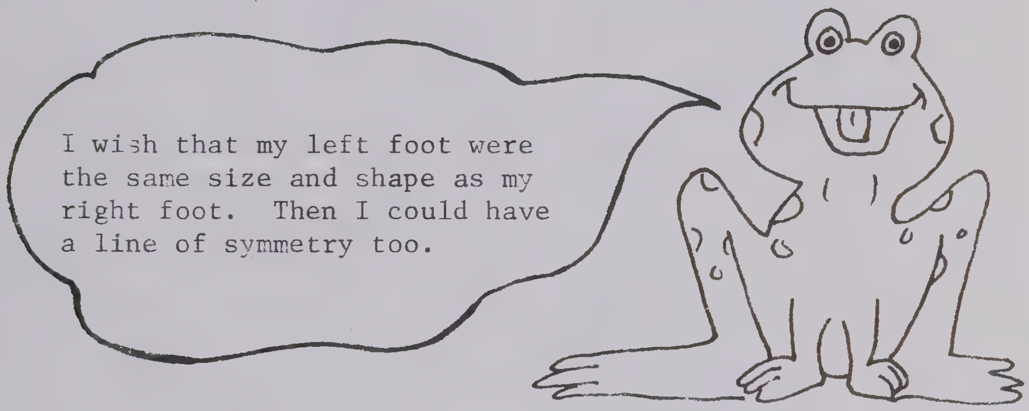


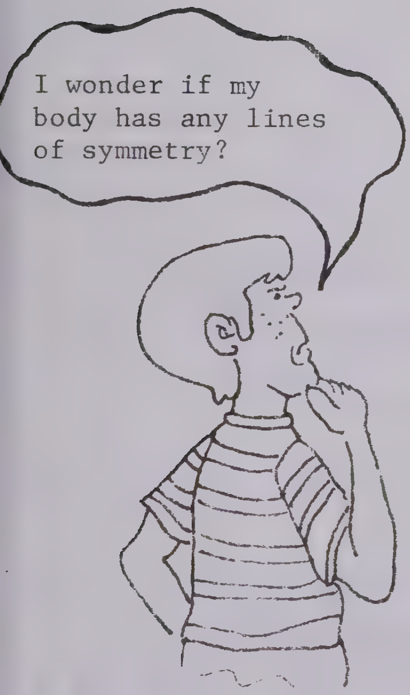


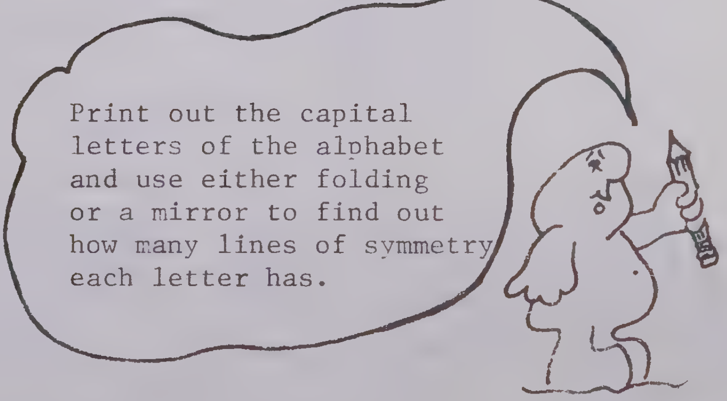


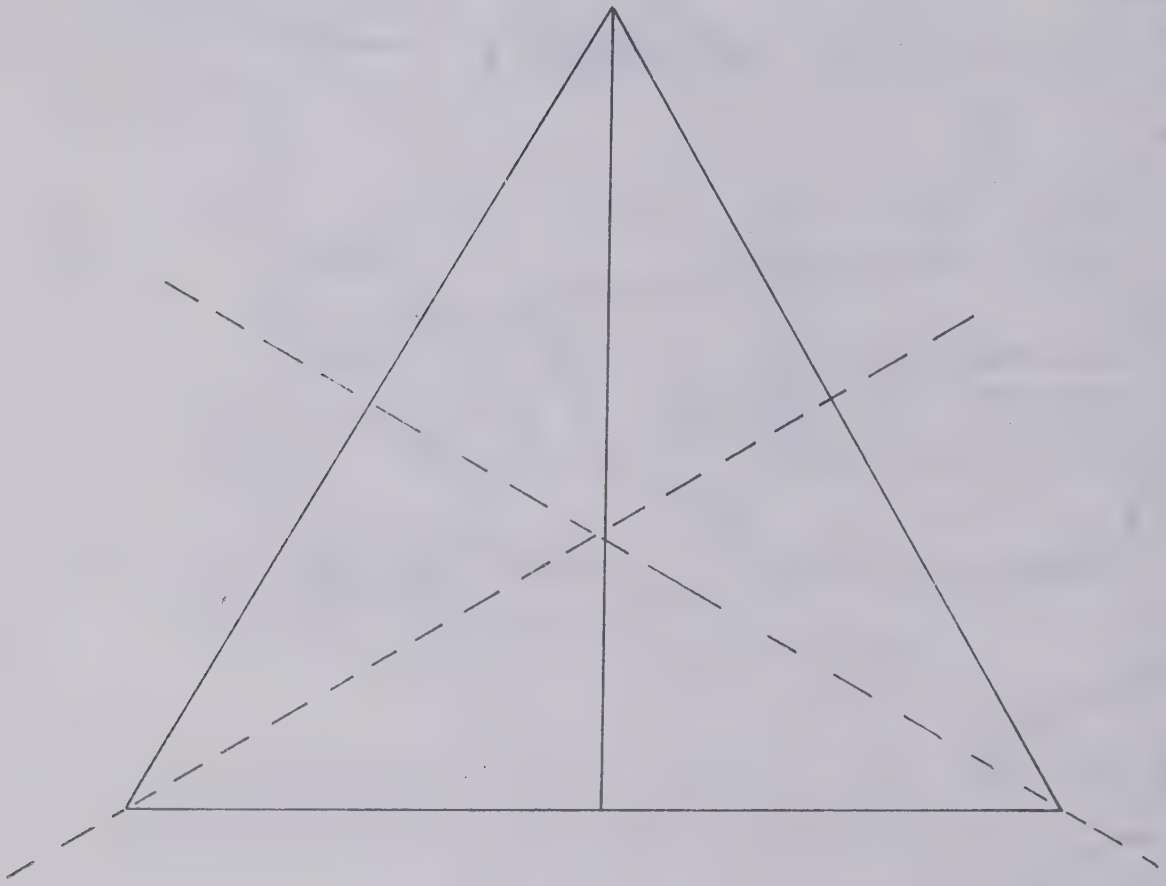

I have one line of symmetry right down the middle of me.

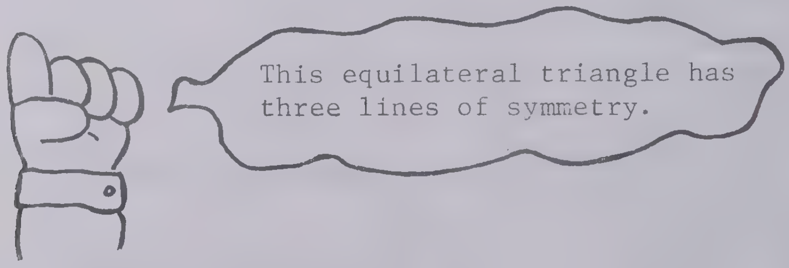

If you folded me in half, my left side would fit exactly on top of my right side.


I wish that my left foot were the same size and shape as my right foot. Then I could have a line of symmetry too.


I wonder if my body has any lines of symmetry?

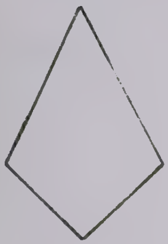

Print out the capital letters of the alphabet and use either folding or a mirror to find out how many lines of symmetry each letter has.



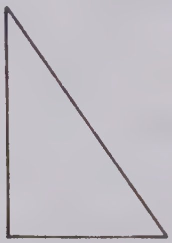

This equilateral triangle has three lines of symmetry.

EXERCISES: UNIT VII OBJECTIVE NO. 10

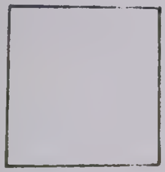
Use folding or a mirror to find the number of lines of symmetry each figures has. Place your answer in the blank beside each figure. Then decode to find the mathematical word below.



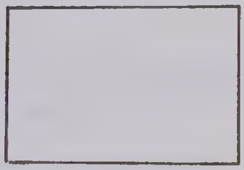
1 t



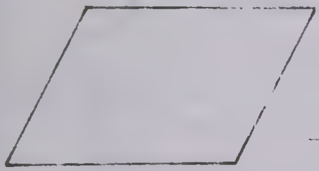
____ e



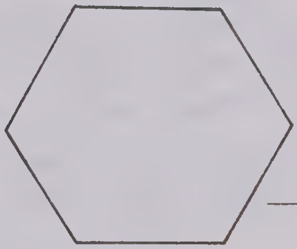
____ y



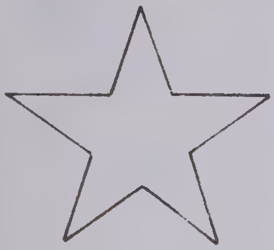
____ s



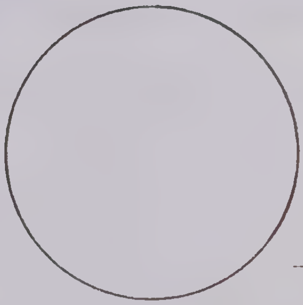
____ m



____ m

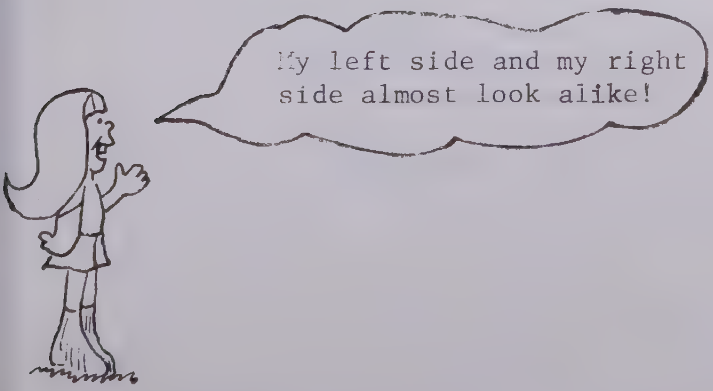


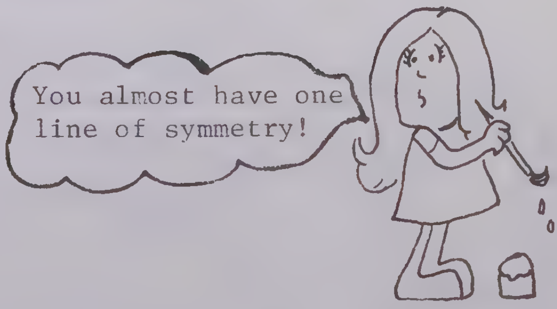
____ r



____ y

					t		
2	4	0	6	0	1	5	infinitely many


My left side and my right side almost look alike!


You almost have one line of symmetry!

Complete an invariance table for a slide, reflection, and half-turn.

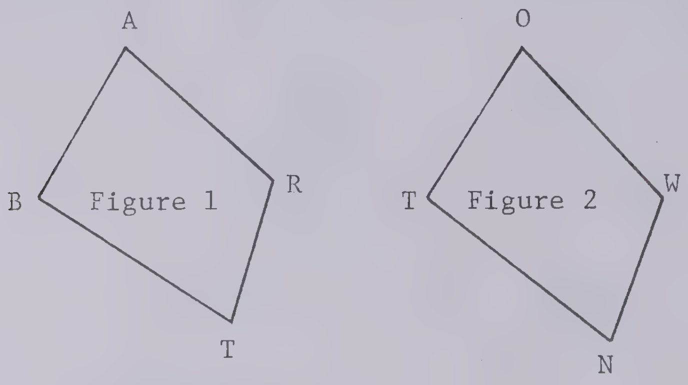
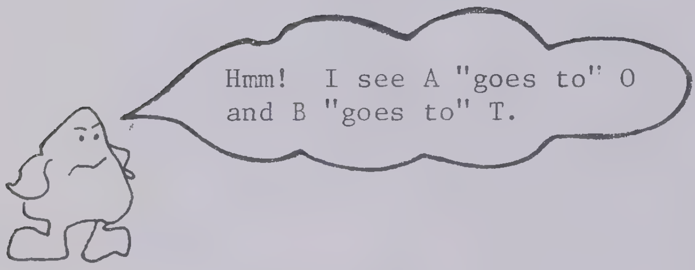
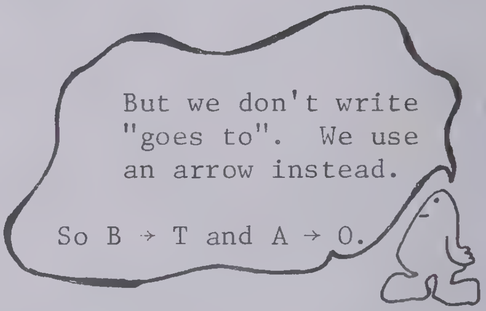


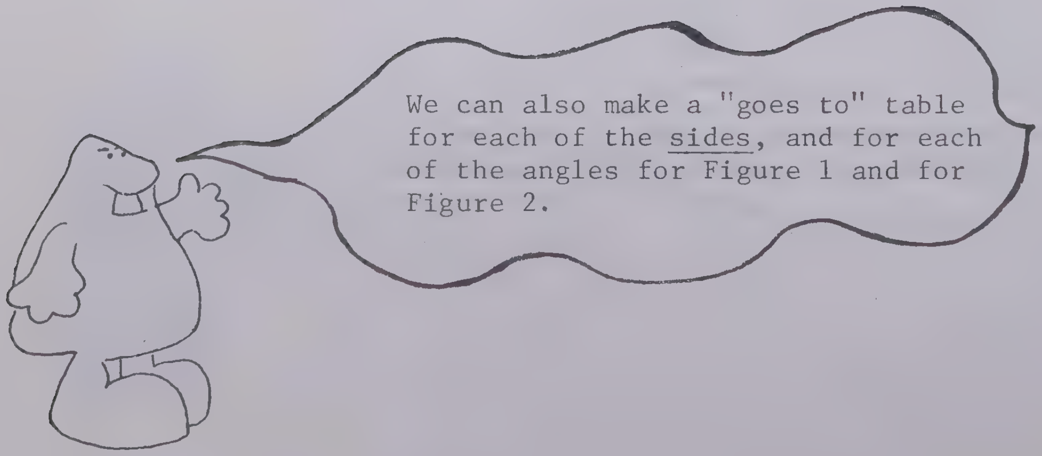
Figure 2 is a slide image of Figure 1.


Hmm! I see A "goes to" O and B "goes to" T.


But we don't write "goes to". We use an arrow instead.
So B → T and A → O.

Complete a "goes to" table for Figure 1 and for Figure 2.

B → T
A → O
R → ____
____ → ____


We can also make a "goes to" table for each of the sides, and for each of the angles for Figure 1 and for Figure 2.

Complete a "goes to" table for the sides of Figure 1 and Figure 2.

$\overline{BA} \rightarrow \overline{TO}$

$\overline{AR} \rightarrow \overline{OW}$

$\overline{RT} \rightarrow$ ___

___ → ___

Complete a "goes to" table for the angles of Figure 1 and Figure 2.

$\angle BAR \rightarrow \angle TOW$

$\angle ART \rightarrow \angle OWN$

$\angle$ ___ → $\angle$ ___

$\angle$ ___ → $\angle$ ___

Each of the "goes to" tables name the corresponding points, sides and angles of Figure 1 and Figure 2.

Example: B → T so B corresponds to T.

$\overline{BA} \rightarrow \overline{TO}$ so BA corresponds to $\overline{TO}$.

$\angle BAR \rightarrow \angle TOW$ so $\angle BAR$ corresponds to $\angle TOW$.

EXERCISES:

1. Trace each of the corresponding segments of Figure 1 and Figure 2 to determine if they are congruent, and complete the table below.

FIGURE 1	FIGURE 2	CONGRUENT?
$\overline{BA}$	$\overline{TO}$	Yes
$\overline{AR}$		

2. Trace each of the corresponding angles of Figure 1 and Figure 2 to determine if they are congruent, and complete the table below.

FIGURE 1	FIGURE 2	CONGRUENT?
BAR		

FIGURE 3

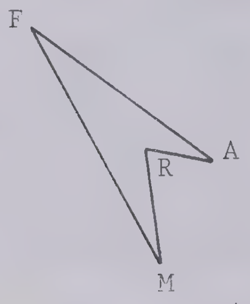


FIGURE 4

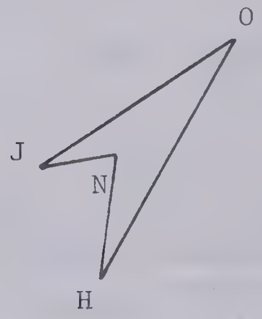


FIGURE 4 is a mirror image of FIGURE 3.

3. Complete a correspondence ("goes to" table for points, segments and angles of Figures 3 and 4.

POINTS	SEGMENTS	ANGLES
F → O	$\overline{FA} \rightarrow \overline{OJ}$	∠FAR → ∠___
A → ___	___ → $\overline{JN}$	∠ARM → ∠JNH
___ → N	___ → ___	∠___ → ∠NHO
___ → ___	___ → $\overline{HO}$	∠___ → ∠___

4. By tracing, determine if each of the corresponding segments, and corresponding angles are congruent. Complete the tables below.

SEGMENTS

FIGURE 3	FIGURE 4	CONGRUENT?
$\overline{FA}$	$\overline{OJ}$	Yes

ANGLES

FIGURE 3	FIGURE 4	CONGRUENT?
∠MFA	∠HOJ	Yes

FIGURE 5

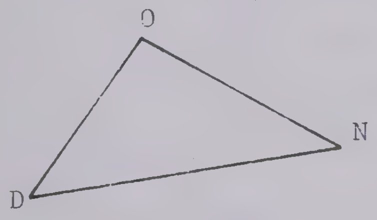


FIGURE 6

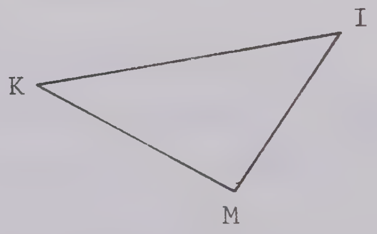


FIGURE 6 is a one-half turn image of FIGURE 5.

5. Complete a correspondence table for points, segments, and angles of Figure 5 and Figure 6. Some are done for you.

POINTS	SEGMENTS	ANGLES
D → I	___ → ___	∠___ → ∠IMK
O → ___	___ → $\overline{KM}$	∠OND → ∠___
___ → ___	___ → ___	∠___ → ∠___

6. By tracing, determine if each of the corresponding segments, and corresponding angles are congruent. Complete the tables below.

SEGMENTS

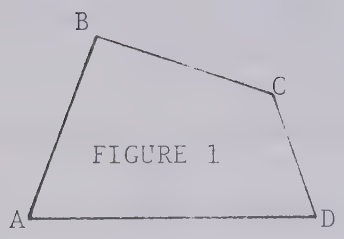
FIGURE 5	FIGURE 6	CONGRUENT?
$\overline{DO}$	$\overline{IM}$	Yes

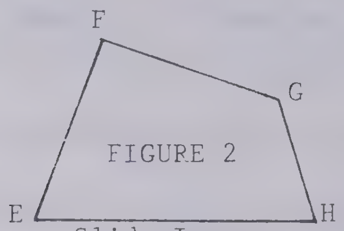
ANGLES

FIGURE 5	FIGURE 6	CONGRUENT?

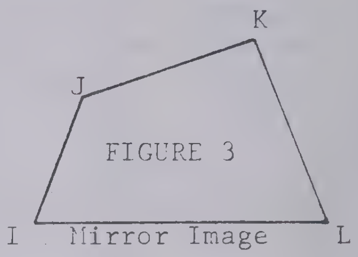
7.

HOW DO YOU SPELL A HORSE?

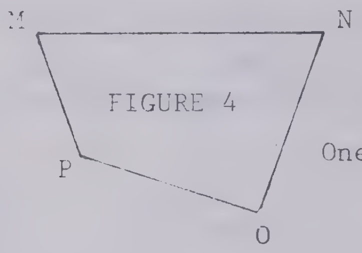




Slide Image



Mirror Image



One-half turn image

Figure 2 is obtained by sliding Figure 1.

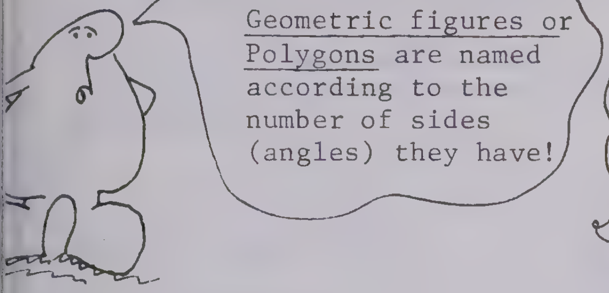
Figure 3 is the reflection of Figure 1.

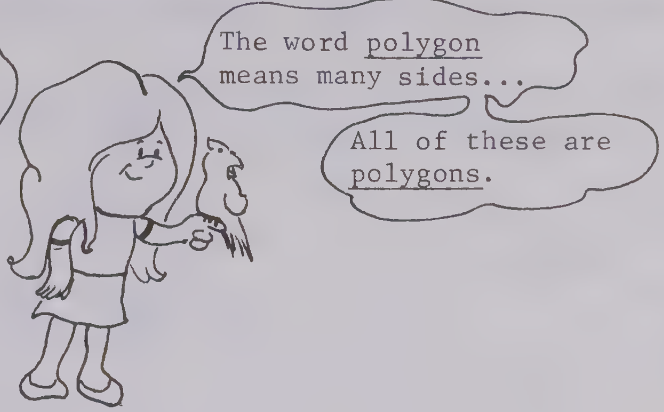
Figure 4 is the result of the rotation of Figure 1 through a half turn.

Answer the following questions and write the letter which is next to the question in the space adjacent to the correct answer at the bottom of the page. Hint: Use correspondence ("goes to") tables to help you find the answers.

C What side in Figure 2 is equal to $\overline{AB}$ in Figure 1? _____
K What angle in Figure 4 is equal to angle ILK in Figure 3? _____
D What angle in Figure 1 is equal to angle KJI in Figure 3? _____
A What side in Figure 2 is equal to $\overline{CD}$ in Figure 1? _____
N What side in Figure 4 is equal to $\overline{AD}$ in Figure 1? _____
P What side in Figure 3 is equal to $\overline{EH}$ in Figure 2? _____
I What side in Figure 1 is equal to IJ in Figure 3? _____
O What angle in Figure 3 is equal to angle BAD in Figure 1? _____
D What side in Figure 4 is equal to BC in Figure 1? _____
A What angle in Figure 4 is equal to angle BCD in Figure 1? _____

C D	M N		M P O		I L	G H	O P	B C D	K L I	E F	M N O

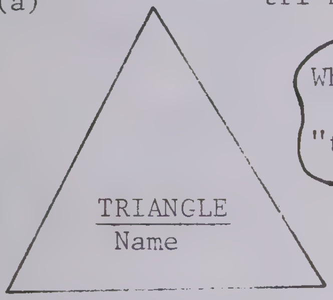

Geometric figures or Polygons are named according to the number of sides (angles) they have!


The word polygon means many sides...
All of these are polygons.

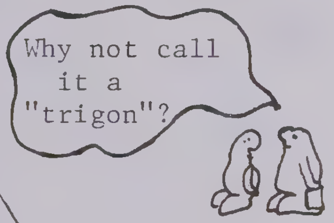
EXERCISES

1. Give a name to each of the polygons below.

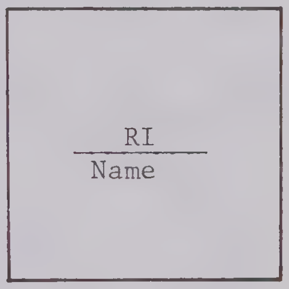
(a) tri-means three



TRIANGLE
Name

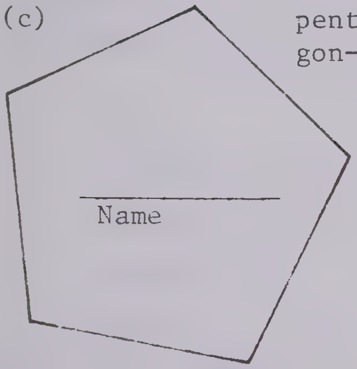

Why not call it a "trigon"?

(b) quad-means four
lateral - means sides



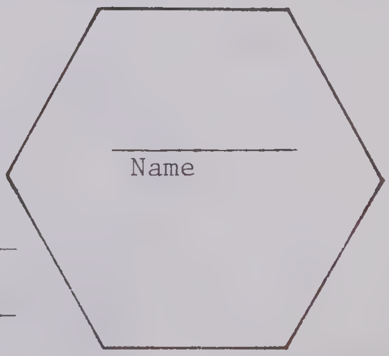
RI
Name

(c) penta-means five
gon-means sides



Name

(d)

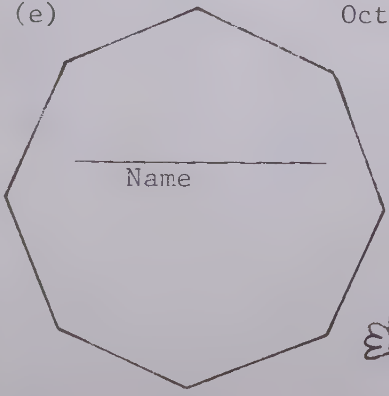


Name

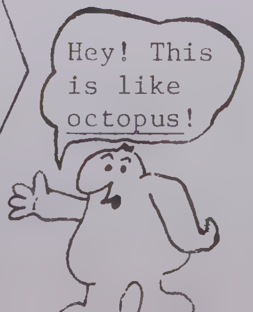
hexa-means ______

gon-means ______

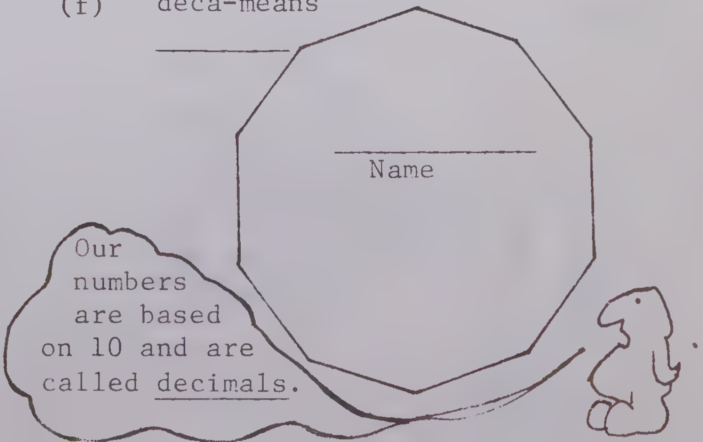
(e) Octa-means ______



Name


Hey! This is like octopus!

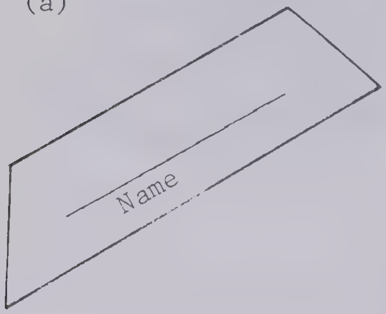
(f) deca-means ______



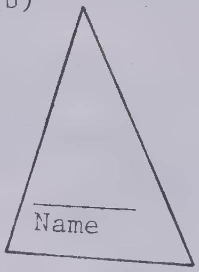
Name

2. Count the sides (angles) and write the best name of each in the blanks.

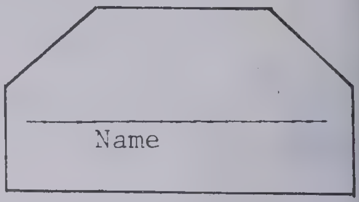
(a)



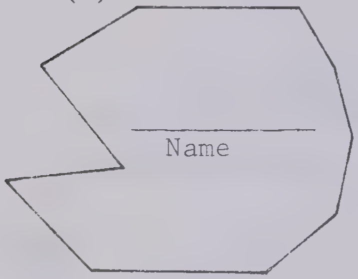
(b)



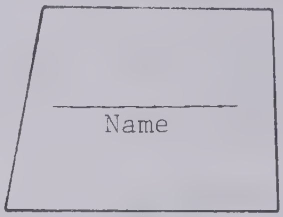
(c)



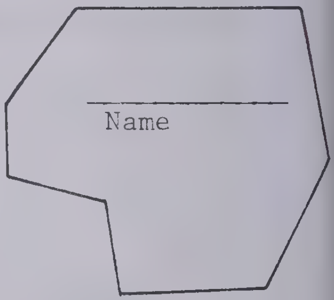
(d)



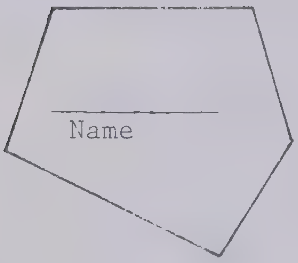
(e)



(f)



(g)

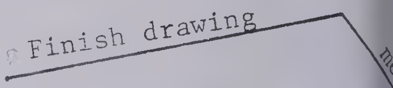


(h) Draw me

Quadrilateral

Name

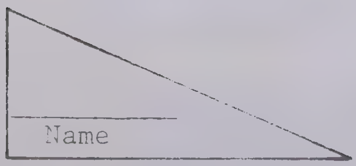
(i)



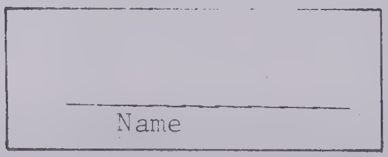
Pentagon

Name

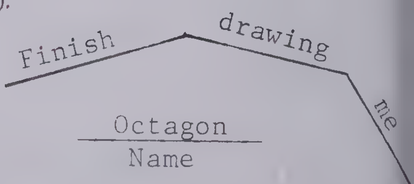
(j)



(k)



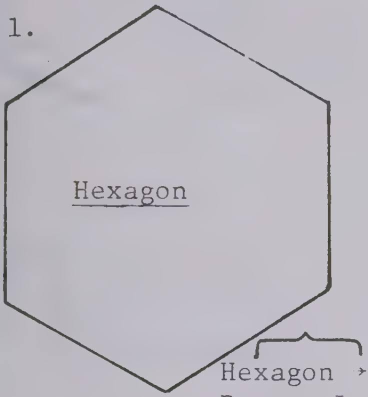
(l).



. Use the words triangle, quadrilateral, pentagon, hexagon, octagon, decagon to describe the shapes below.

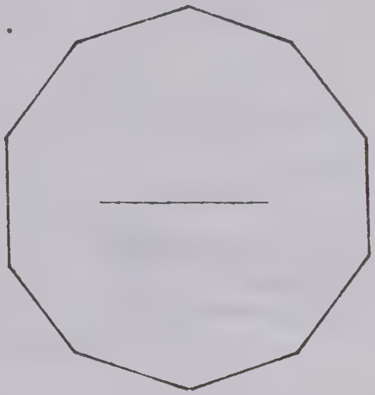
Place the correct word in the blank inside the shape. Match the word with the letter at the bottom and put the letter in the appropriate place in the code.

1.

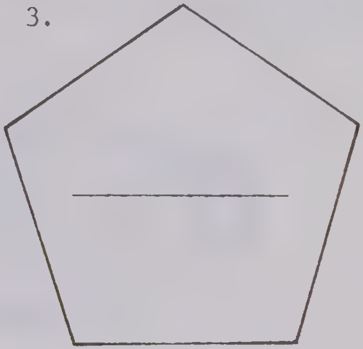


Hexagon → L.
Put an L in every blank numbered 1.

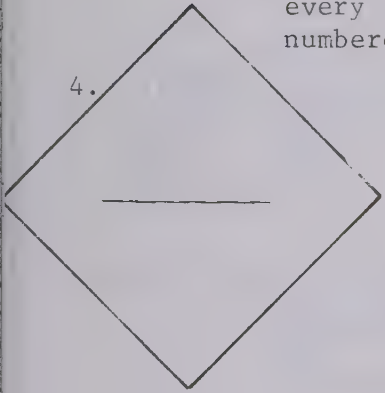
2.



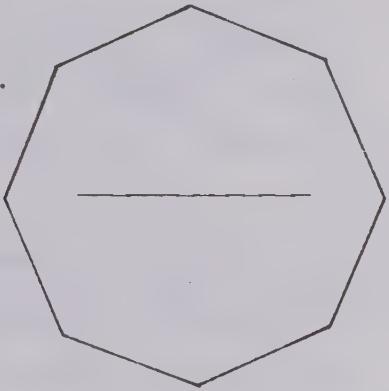
3.



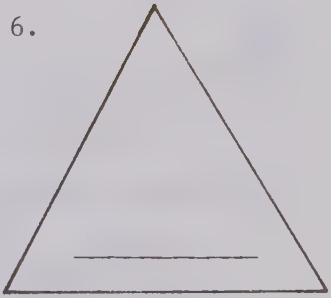
4.



5.

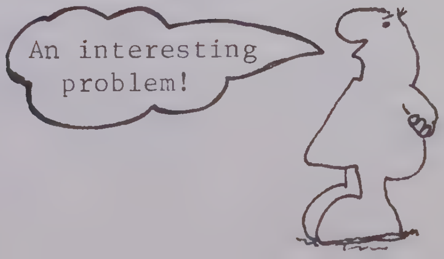


6.

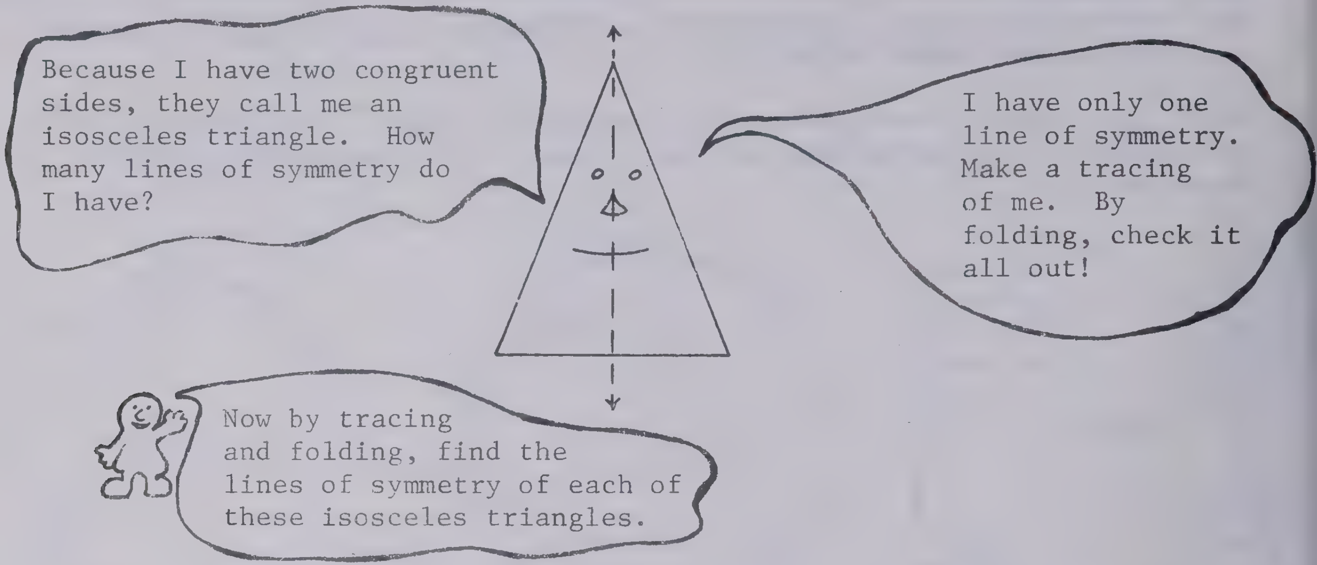


Pentagon - A
Octagon - R
Decagon - Y
Hexagon - L
Triangle - O
Quadrilateral - P

F	L	___	___	___	___	___		___	___	___	___	___	T
	1	2	3		3	2		4	3	5	5	6	
E	Q	U	___	L	S		___	___	L	___	G	___	N
			3	1			4	6	1	2		6	


An interesting problem!

1.

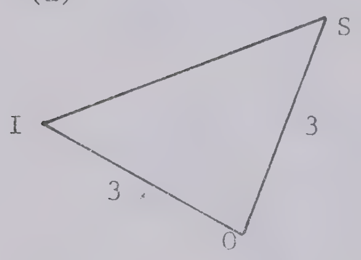


Because I have two congruent sides, they call me an isosceles triangle. How many lines of symmetry do I have?

I have only one line of symmetry. Make a tracing of me. By folding, check it all out!

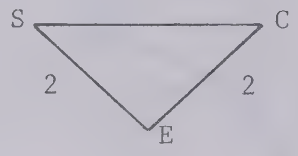
Now by tracing and folding, find the lines of symmetry of each of these isosceles triangles.

(a)



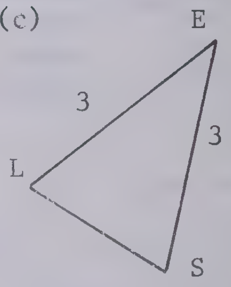
______

(b)

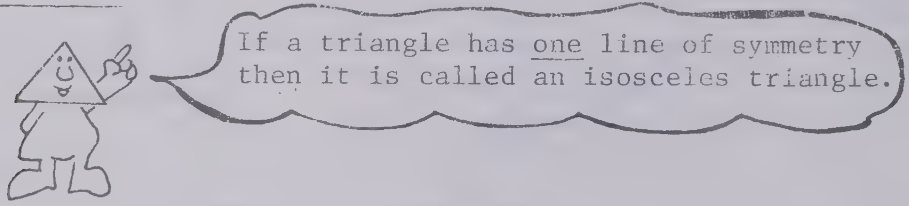


______

(c)

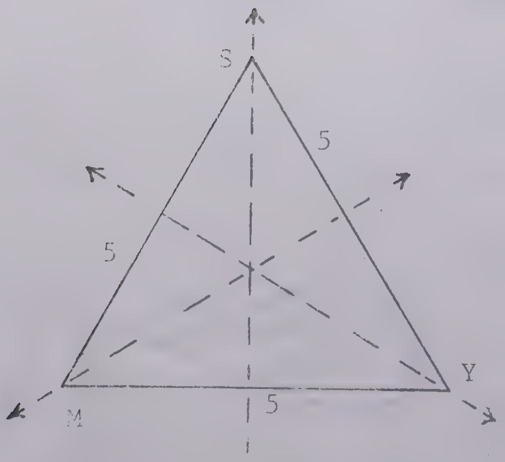


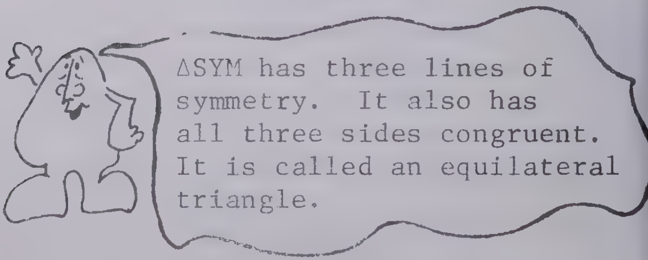
______



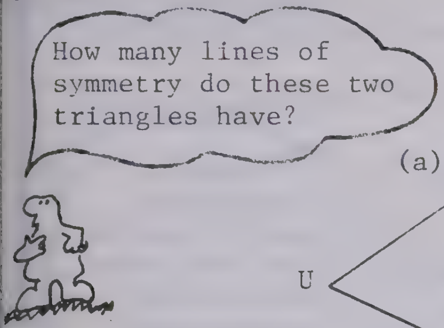
If a triangle has one line of symmetry then it is called an isosceles triangle.

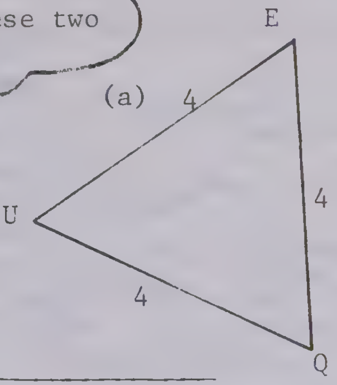
2.



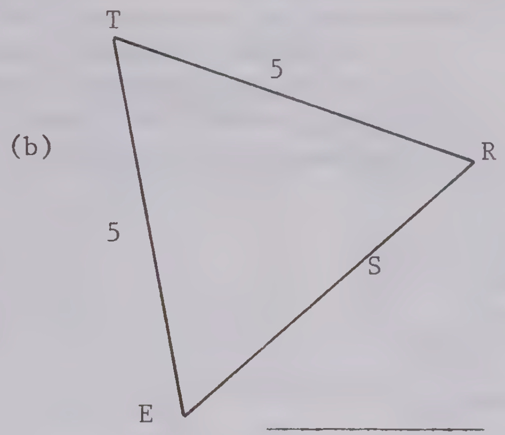


ΔSYM has three lines of symmetry. It also has all three sides congruent. It is called an equilateral triangle.

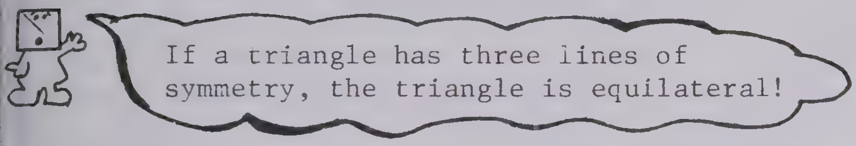

How many lines of symmetry do these two triangles have?


(a)
E
4
4
U
4
Q

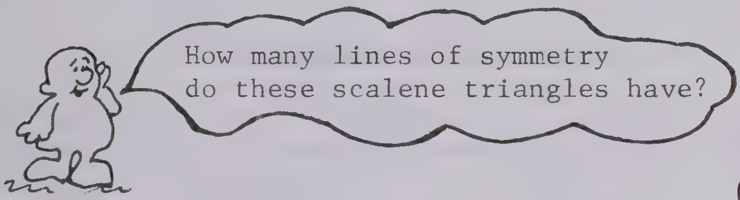
____

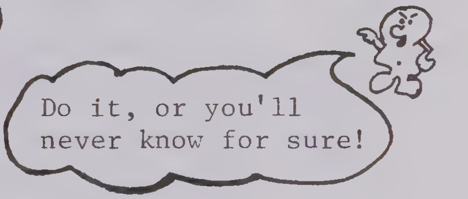

(b)
T
5
R
5
S
E

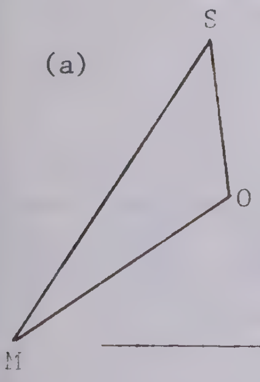
____


If a triangle has three lines of symmetry, the triangle is equilateral!

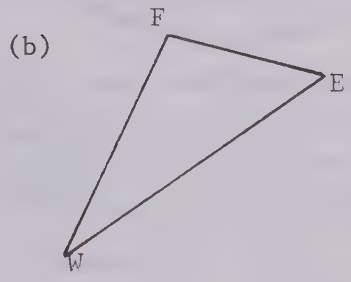
3.


How many lines of symmetry do these scalene triangles have?

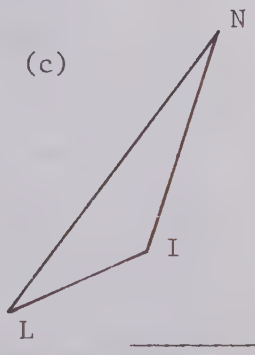

Do it, or you'll never know for sure!


(a)
S
O
M

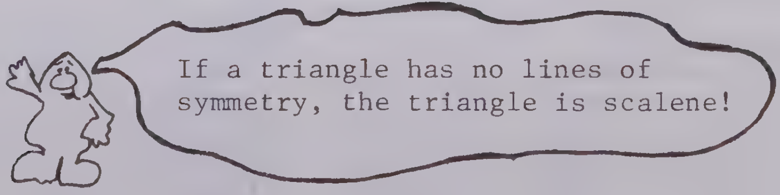
____

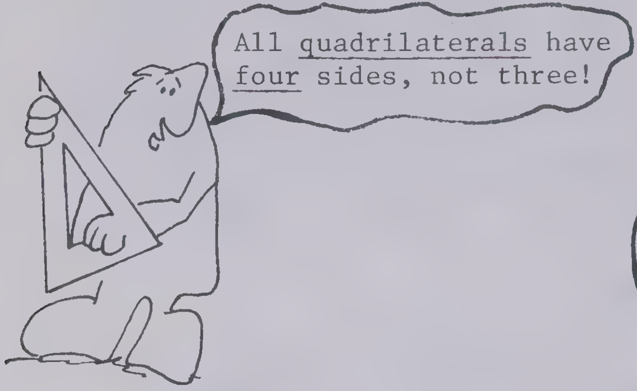

(b)
F
E
W

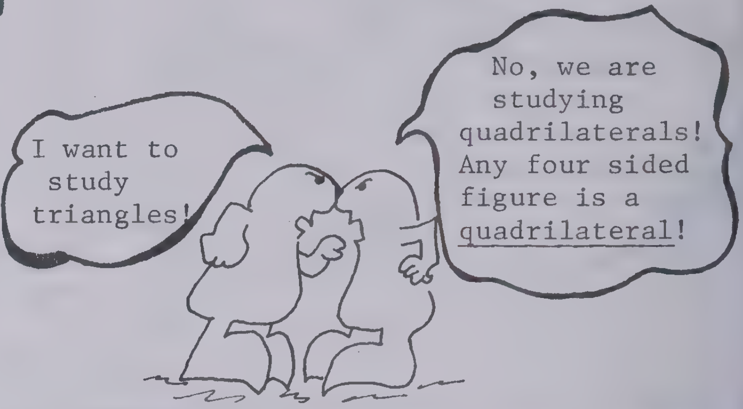
____


(c)
N
I
L

____


If a triangle has no lines of symmetry, the triangle is scalene!

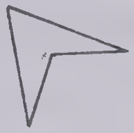

All quadrilaterals have four sides, not three!


I want to study triangles!
No, we are studying quadrilaterals! Any four sided figure is a quadrilateral!

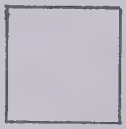
EXERCISES

1. Place a (√) inside those figures that are quadrilaterals.

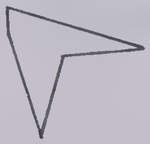
(a)



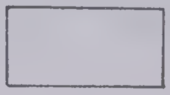
(b)



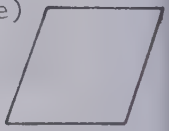
(c)

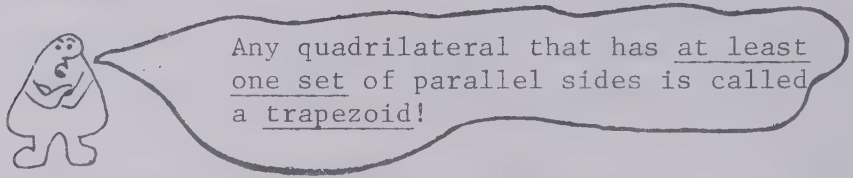


(d)



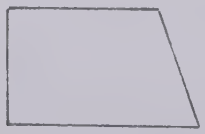
(e)



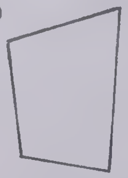

Any quadrilateral that has at least one set of parallel sides is called a trapezoid!

2. Place a (√) inside those figures that are trapezoids.

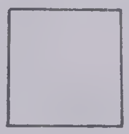
(a)



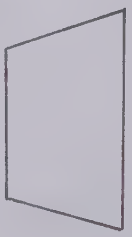
(b)



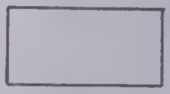
(c)

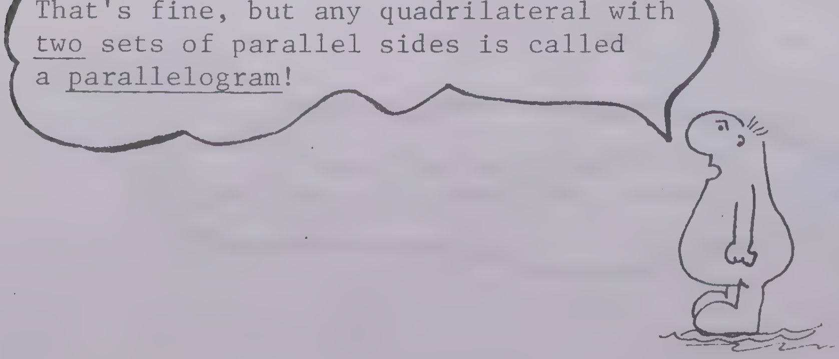


(d)



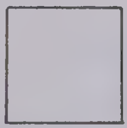
(e)



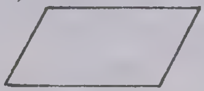

That's fine, but any quadrilateral with two sets of parallel sides is called a parallelogram!

Place a (✓) inside those figures that are parallelograms.

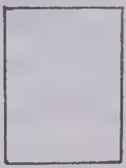
(a)



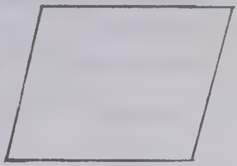
(b)



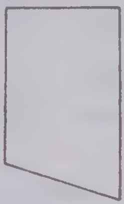
(c)

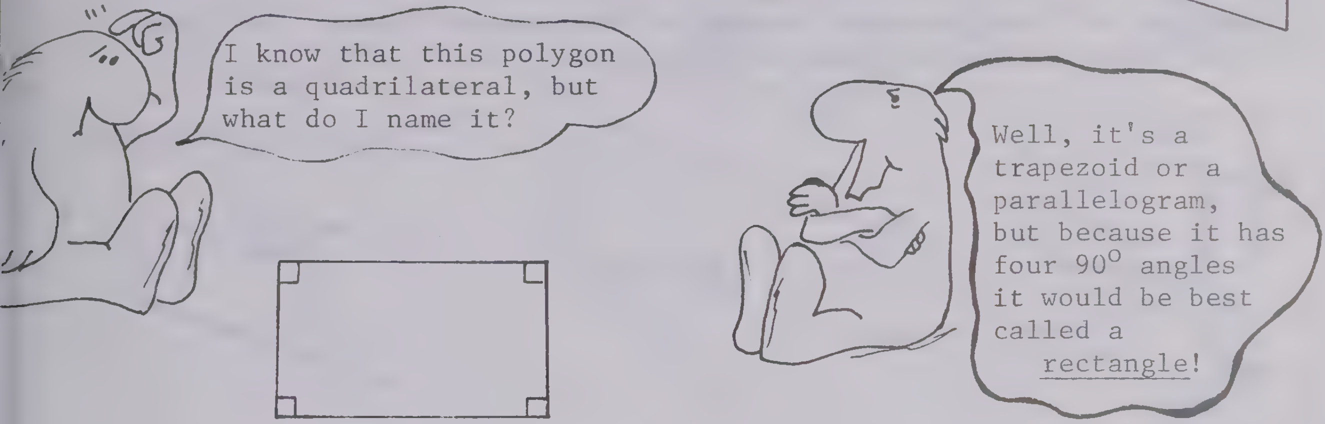


(d)



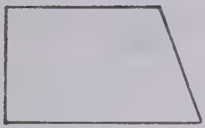
(e)



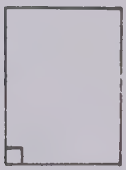

I know that this polygon is a quadrilateral, but what do I name it?
Well, it's a trapezoid or a parallelogram, but because it has four 90° angles it would be best called a rectangle!

Place a (✓) inside those figures that are rectangles.

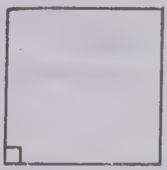
(a)



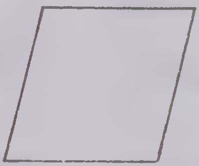
(b)



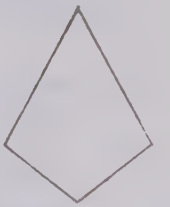
(c)

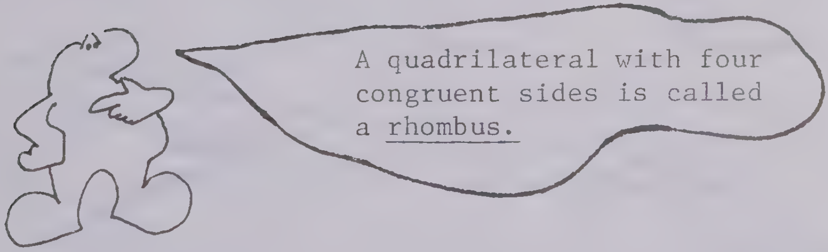


(d)



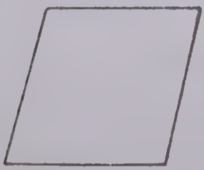
(e)



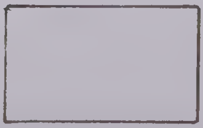

A quadrilateral with four congruent sides is called a rhombus.

Place a (✓) inside each figure that is a rhombus.

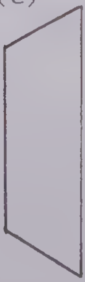
(a)



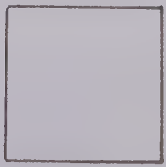
(b)



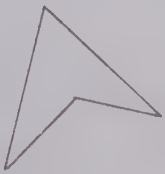
(c)

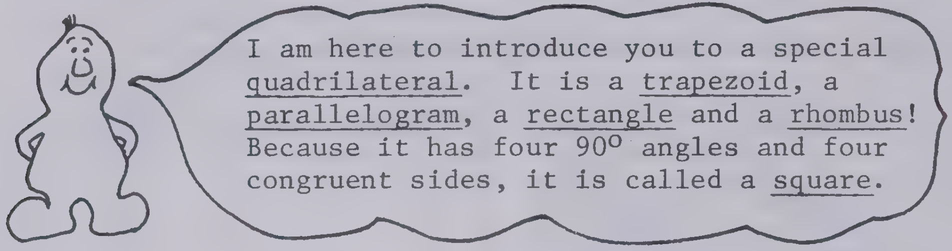


(d)



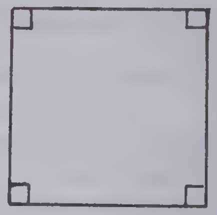
(e)





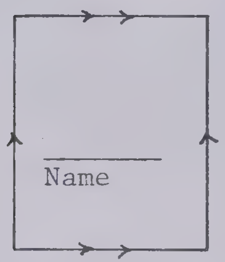
I am here to introduce you to a special quadrilateral. It is a trapezoid, a parallelogram, a rectangle and a rhombus! Because it has four 90° angles and four congruent sides, it is called a square.

SQUARE

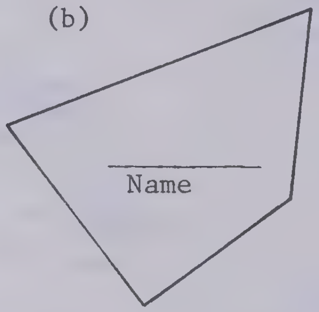


6. Give the BEST possible name to each of the polygons below. The arrows on the sides show which sides are parallel.

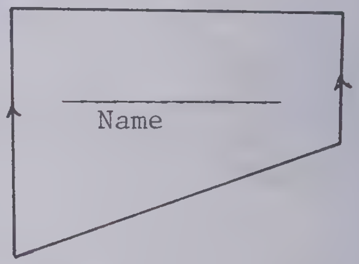
(a)



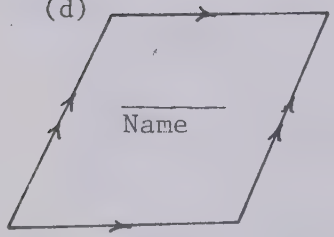
(b)



(c)



(d)



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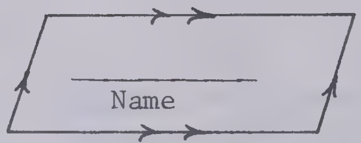

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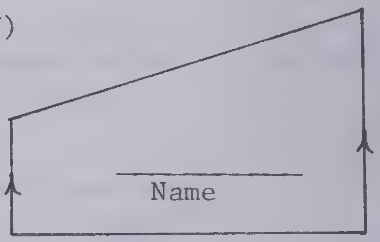
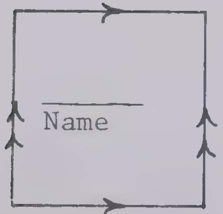


(g)



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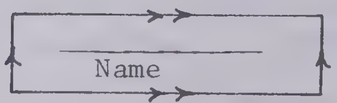
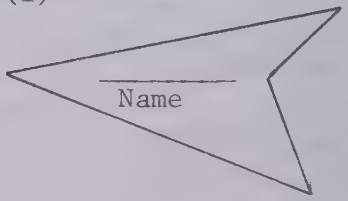
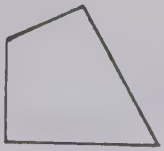


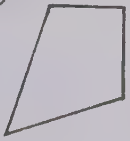
(i)



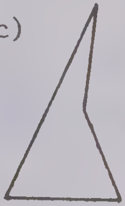
7. (a)



(b)

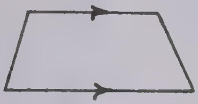


(c)



Where are the directions?

(d)



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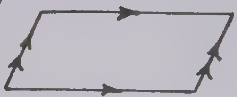
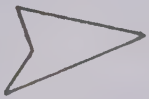
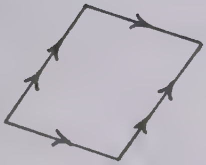


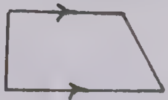
(f)



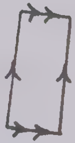
(g)



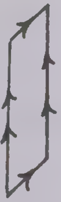
(h)



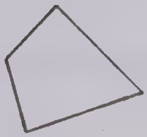
(i)



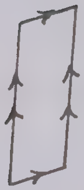
(j)



(k)



(l)



Fill in the spaces below according to the following code:

square - t

rectangle - l

rhombus - n

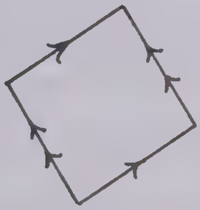
parallelogram - e

trapezoid - g

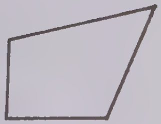
quadrilateral - a

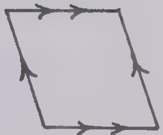
e.g. Figure #1 is a quadrilateral. Fill #1 with "a".

(m)

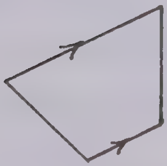


(n)

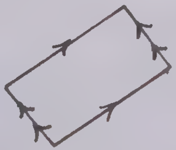




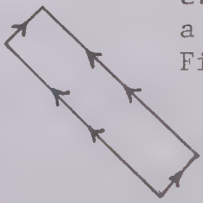
(p)



(q)



(r)

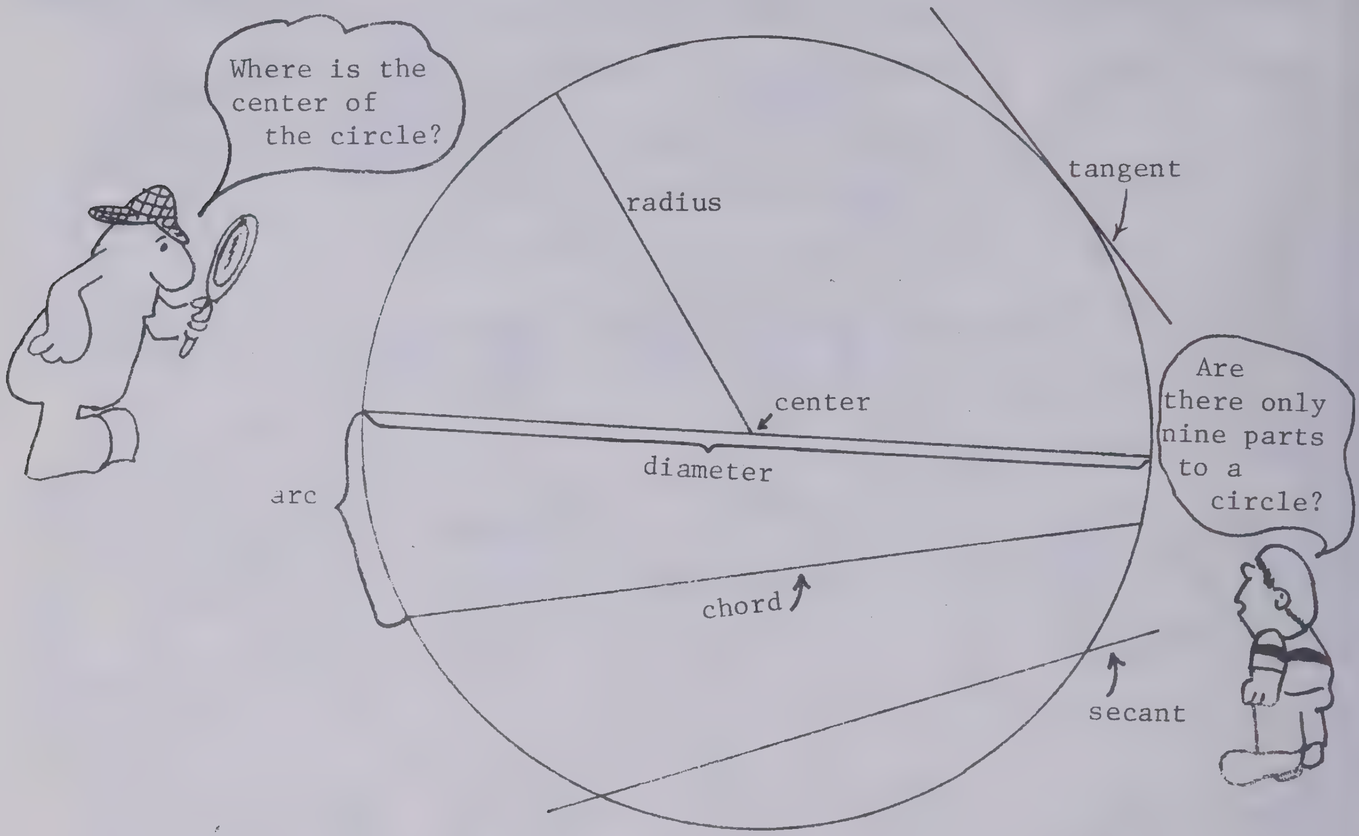


A D ___ M ___ ___ ___ D ___ ___ ___ ___ ___ equals

1 2 3 4 5 6 7 8 9 10

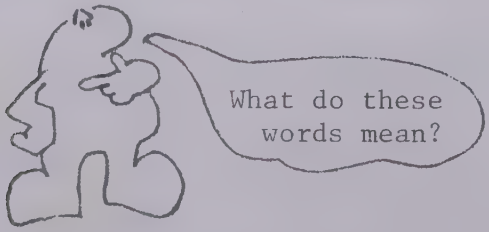
___ R ___ C ___ ___ ___ ___ ___ ___

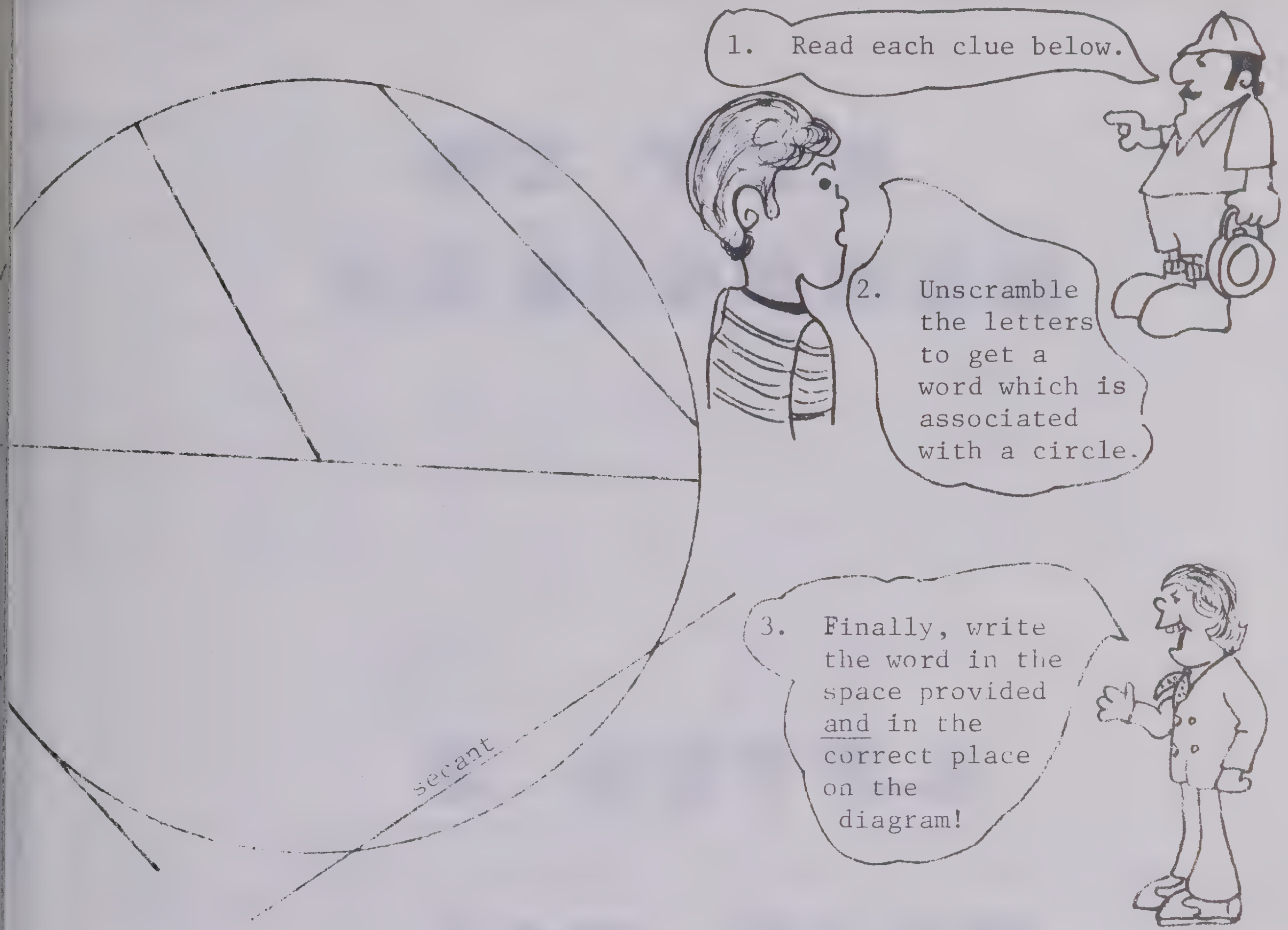
11 12 13 14 15 16 17 18


Where is the center of the circle?
radius
tangent
center
Are there only nine parts to a circle?
arc
diameter
chord
secant

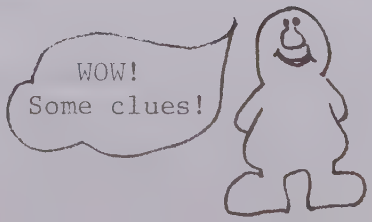
1. Using the diagram above as a clue match the word with the correct definition.

	Word			Definition
1.	circle	________	a.	the distance across a circle going through the center
2.	radius	________	b.	a line just touching the circle
3.	chord	________	c.	part of a circle
4.	diameter	________	d.	going all the way around staying the same distance from the center
5.	arc	________	e.	the very middle
6.	semi-circle	________	f.	from the middle to the circle
7.	tangent	________	g.	half of the circle
8.	secant	________	h.	half of the circle
9.	centre	________	i.	from one side of the circle to the other


What do these words mean?


1. Read each clue below.
2. Unscramble the letters to get a word which is associated with a circle.
3. Finally, write the word in the space provided and in the correct place on the diagram!
secant

	Clue	Scrambled letters	Correct spelling
1.	looking for the wife of your uncle	atnecs	(a) secant
2.	easily played on an organ or a guitar	rohcd	(b) ______________
3.	Noah built one	car	(c) ______________
4.	half way around the circle	eism-leircc	(d) ______________
5.	the sun is this of the solar system	ternec	(e) ______________
6.	half way across	uidsar	(f) ______________
7.	man spending time on the sun	ntatnge	(g) ______________
8.	the death of a metric unit of length	ter i maed	(h) ______________


WOW!
Some clues!

KEY TO EXERCISES

LEVEL 7

UNIT VII

GEOMETRY

Key to Exercises

Objective No. 10

"Symmetry"

Objective No. 16

1.

Figure 1	Figure 2	Congruent?
$\overline{BA}$	$\overline{TO}$	Yes
$\overline{AR}$	$\overline{OW}$	Yes
$\overline{RT}$	$\overline{WN}$	Yes
$\overline{TB}$	$\overline{NT}$	Yes

2.

Figure 1	Figure 2	Congruent?
$\angle BAR$	$\angle TOW$	Yes
$\angle ART$	$\angle OWN$	Yes
$\angle RTB$	$\angle WNT$	Yes
$\angle TBA$	$\angle NTO$	Yes

3.

F → O	$\overline{FA} \to \overline{OJ}$	FAR → $\angle OJN$
A → J	$\overline{AR} \to \overline{JN}$	ARM → $\angle JNH$
R → N	$\overline{RM} \to \overline{NH}$	RMF → $\angle NHO$
M → H	$\overline{MF} \to HO$	MFA → $\angle HOJ$

4.

Figure 3	Figure 4	Congruent?
$\overline{FA}$	$\overline{OJ}$	Yes
$\overline{AR}$	$\overline{JN}$	Yes
$\overline{RM}$	$\overline{NH}$	Yes
$\overline{MF}$	$\overline{HO}$	Yes

Figure 3	Figure 4	Congruent?
$\angle FAR$	$\angle OJN$	Yes
$\angle ARM$	$\angle JNH$	Yes
$\angle RMF$	$\angle NHO$	Yes
$\angle MFA$	$\angle HOJ$	Yes

5.

D → T	$\overline{DO} \to \overline{TE}$	DON → $\angle TED$
O → E	$\overline{ON} \to \overline{ED}$	OND → $\angle EDT$
N → D	$NO \to DT$	NDO → $\angle DTE$

6.

Figure 5	Figure 6	Congruent?
$\overline{DO}$	$\overline{IM}$	Yes
$\overline{ON}$	$\overline{KM}$	Yes
$\overline{ND}$	$\overline{KI}$	Yes

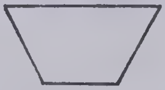
Figure 5	Figure 6	Congruent?
$\angle DON$	$\angle KMI$	Yes
$\angle OND$	$\angle MKI$	Yes
$\angle NDO$	$\angle KIM$	Yes

7. "In a paddock."

Objective No. 17

1. (b) quadrilateral
   (c) pentagon
   (d) hexagon
   (e) octagon
   (f) decagon

2. (a) trapezoid
   (b) triangle
   (c) hexagon
   (d) decagon
   (e) trapezoid
   (f) octagon
   (g) pentagon
   (h)



   (i) 3 more sides
   (j) triangle
   (k) rectangle
   (l) 5 more sides

3. "Fly away parrot equals polygon."

Objective No. 18

1. (a) 1 (b) 1 (c) 1

2. (a) 3 (b) 3

3. (a) 0 (b) 0 (c) 0

Objective No. 19

1. Figures (a), (b), (d), (e) are quadrilaterals.

2. Figures (a), (c), (d), (e) are trapezoids.

3. Figures (a), (b), (c), (d) are parallelograms.

4. Figures (b) and (c) are rectangles.

5. Figures (a) and (d) are rhombi.

6. (a) rectangle
   (b) quadrilateral
   (c) trapezoid
   (d) rhombus
   (e) parallelogram
   (f) trapezoid
   (g) square
   (h) rectangle
   (i) quadrilateral

7. "A damaged angle equals a rectangle."

Key to Exercises

Objective No. 21

1. (b) tangent
   (c) arc
   (d) circle
   (e) center
   (f) radius
   (g) semi-circle
   (h) secant
   (i) chord

2. (b) chord
   (c) arc
   (d) semi-circle
   (e) center
   (f) radius
   (g) tangent
   (h) diameter

MEASUREMENT

LEVEL 8

UNIT II

CONTENTS

Unit II - Measurement

B. Area Measure:

PAGE

OBJECTIVE 1: Define area measure as the number of unit squares a region contains. .... 227.

OBJECTIVE 2: Express measure of area correctly by including numeral and unit. .... 230.

OBJECTIVE 5: Perform the operations of addition, subtraction, multiplication, and division with units of measure. .... 232.

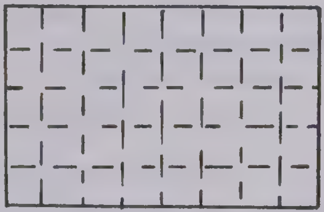
C. Angular Measure:

OBJECTIVE 1: Estimate the size of a given angle ($\pm 20^{\circ}$). (Limit: 180°). .... 240.

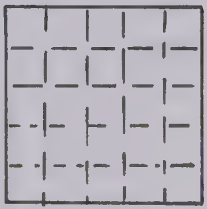
KEY TO EXERCISES .... 246.

1. Match each figure with its area from the list at the right.

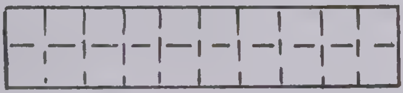
(a)



(b)



(c)



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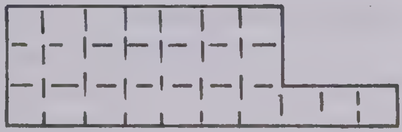
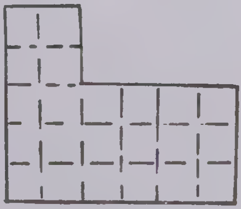
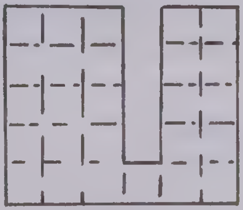


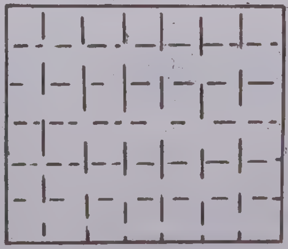
(e)



(f)



(g)



20 square units

22 square units

24 square units

25 square units

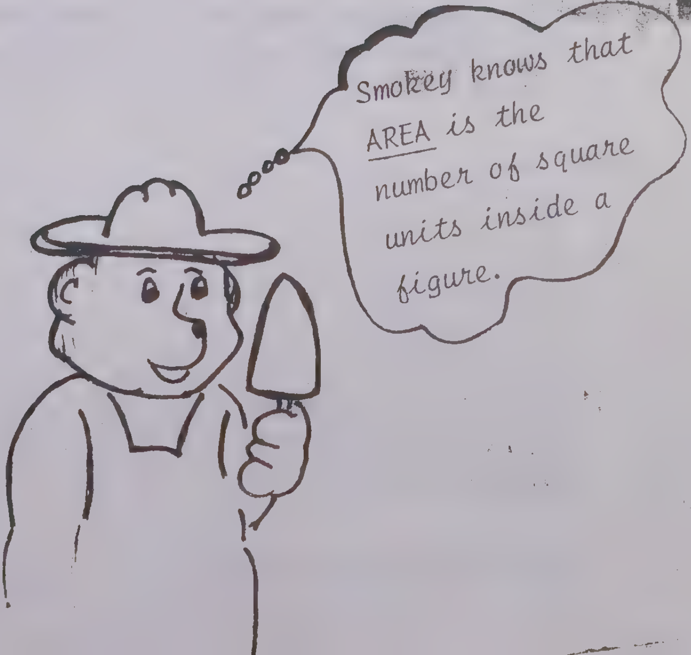
26 square units

28 square units

40 square units

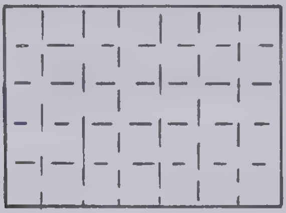
42 square units

45 square units


Smokey knows that AREA is the number of square units inside a figure.

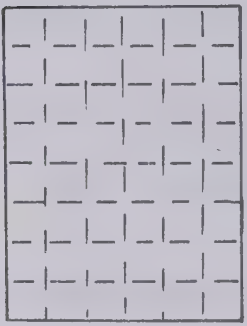
2. Find the area of each figure.

(a)



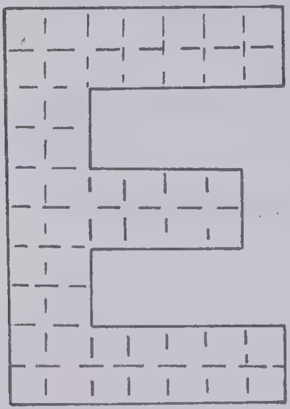
________ square units

(b)



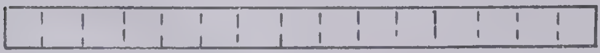
________ square units

(c)



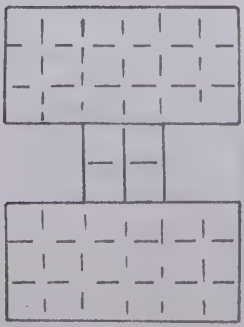
________ square units

(d)



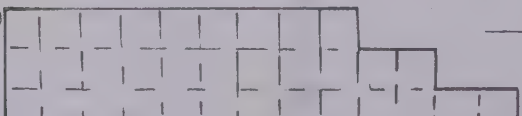
__________ square units

(e)



_________ square units

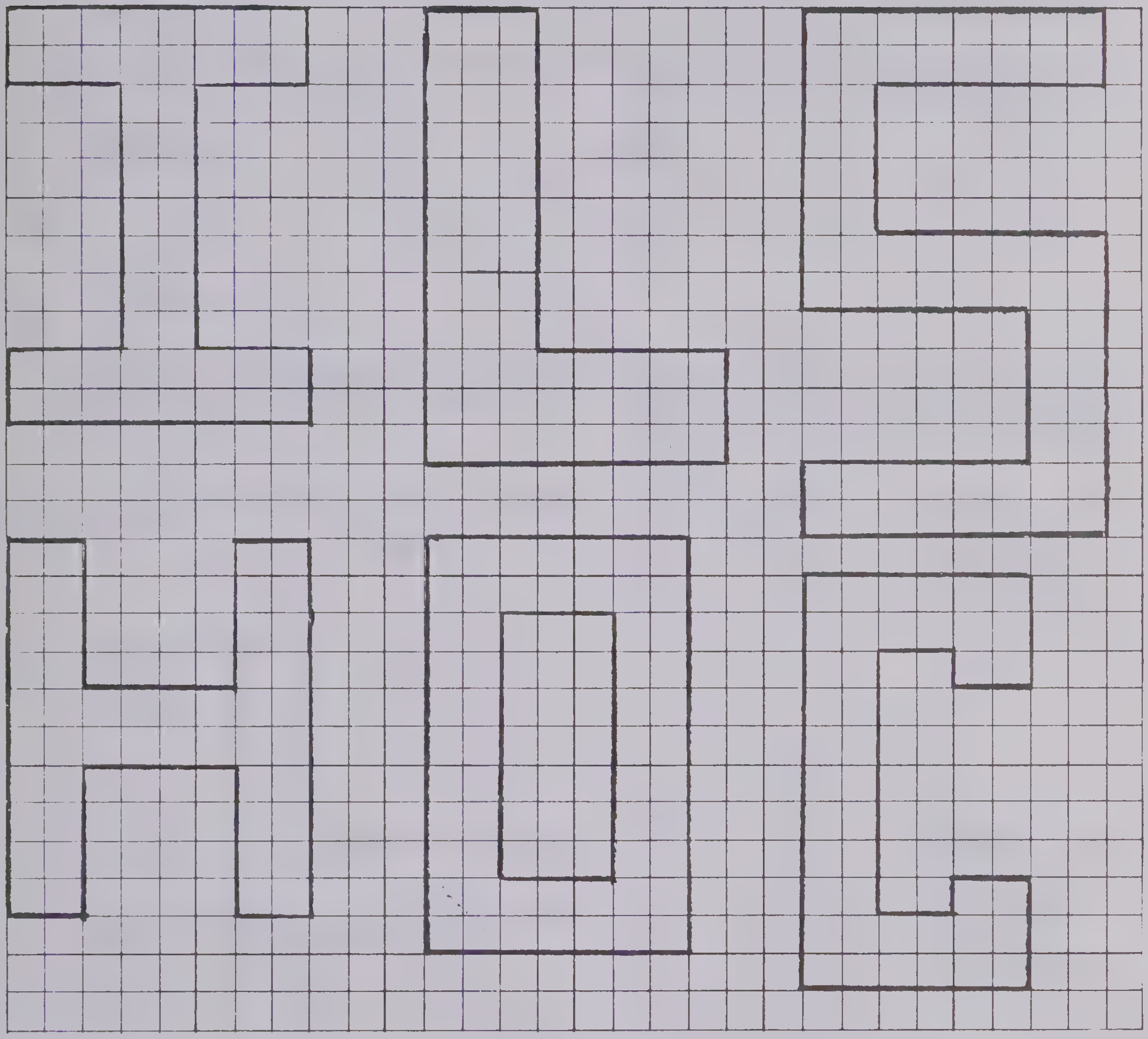
(f)



_________ square units

3. SWINGING SIXTIES SAYING:

Find the area of each letter and find your answer in the code at the bottom. Each time the answer appears in the code, write the letter above it. Keep on working until you have decoded the "Swinging Sixties Saying".



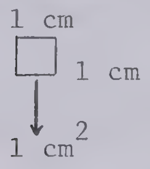
___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
64 42 48 56 56 51 46 64 42 56 56 51

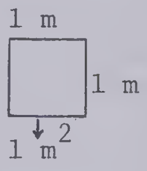
AREA - *the number of unit squares inside a figure.*

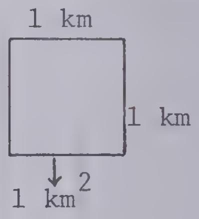
Since objects are measured in some kind of unit you must expand your definition slightly.

- Objects whose sides are measured in cm will have area of square cm (written cm^2).

- Objects whose sides are measured in m will have areas of square m (written m^2).

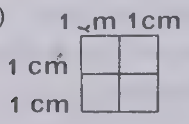






1. For the figures below, first find the area by counting unit squares, then write the area of the figure correctly - number and proper unit. The first one is done for you.

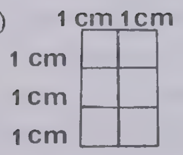
(a)



Think: 4 unit squares
-sides are cm

area is 4 cm^2

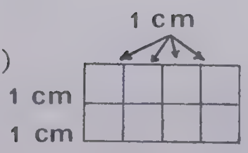
(b)



Unit squares: __________

Area is: __________ __________
(number) (unit)

(c)

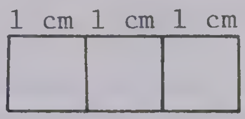


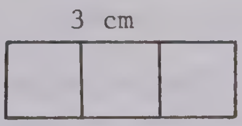
Unit squares: __________

Area is: __________ __________
(number) (unit)

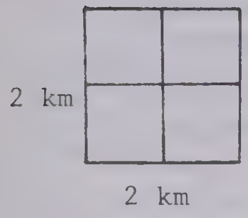
2. From now on the total length of the side will be shown instead of the length of each unit.

e.g.



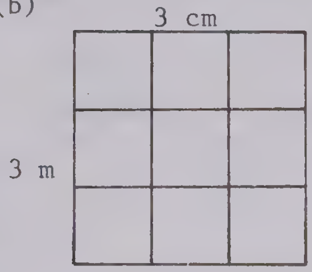


(a)



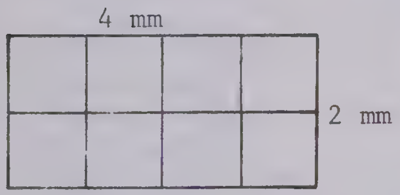
Area is: ____________

(b)



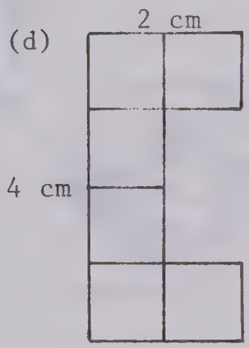
Area is: ____________

(c)



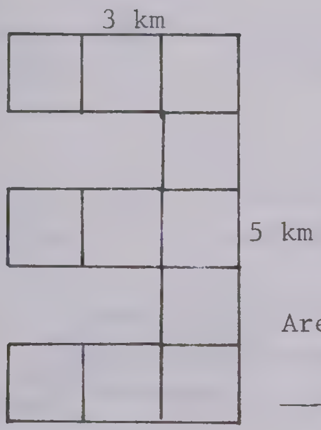
Area is: ____________

(d)



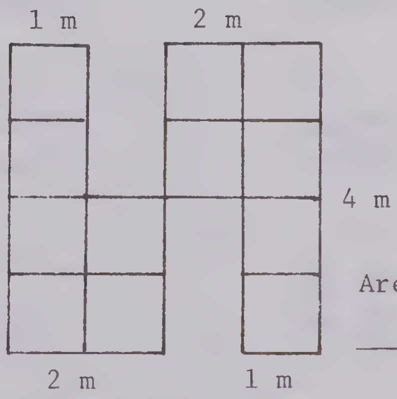
Area is: ____________

(e)



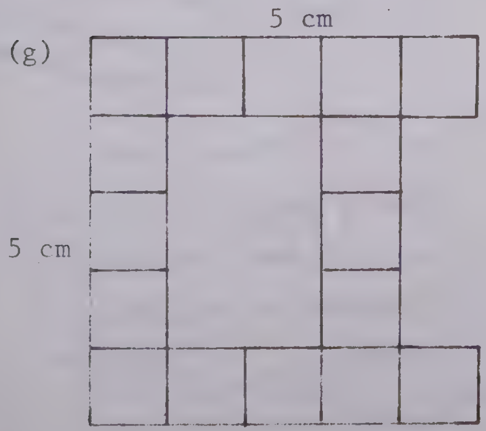
Area is: ____________

(f)



Area is: ____________

(g)



Area is: ____________

The last three questions spell out a message.
Can you figure it out?

ADDITION

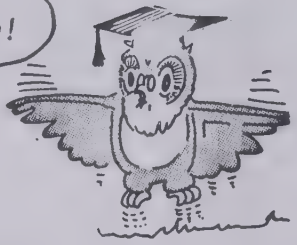
Example A:

6.8 cm + 3.4 cm

Rewrite in a straight line.

$$\begin{array}{r} 6.8\ \text{cm} \\ +\ 3.4\ \text{cm} \\ \hline 10.2\ \text{cm} \end{array}$$

NOTICE: Decimals are in a straight line.


+ like u normally do!

DON'T FORGET UNITS!

1. Add:

(a) 50 cm +30 cm	(b) 100 mm + 29 mm	(c) 25 m +87 m	(d) 128 m +911 m
(e) 904 mm +876 mm	(f) 555 km + 78 km	(g) 267 mm +389 mm	(h) 806 km +962 km
(i) 400 cm +392 cm			
(j) 3.2 cm +84.37 cm	(k) 48.78 km +39.22 km	(l) 78.16 cm +35.23 cm	

DON'T FORGET UNITS!

Notice... Decimals are in a straight line.

(m) 88.15 km + 86.17 km =

(n) 64.32 cm + 49.0 cm =

(o) 562.87 m + 0.35 m =

(p) 56.38 km + 38.25 km =

(q) 84.02 m + 98.28 m =

(r) 91.18 m + 109.94 m =

Don't forget to rewrite up and down, keeping decimals in a straight line.

2. RIDDLE MATH:

"WHAT KIND OF BOAT DOES A VAMPIRE LIKE TO RIDE ON?"

The answer to this riddle is written in code at the bottom of the page. To break the code, work on any problem and find the answer in the code. Each time the answer appears in the code, write the letter of the problem below it.

A 870 km + 3960 km =

B 380 cm + 796 cm + 843 cm =

E 0.47 cm + 84.0 cm =

L 0.48 m + 9 m =

O 38 m + 0.58 m =

D 965 km + 4 km =

C 145 mm + 628 mm + 450 mm =

S 5 km + 0.39 km =

U 63 km + 0.87 km =

V 0.0 cm + 4 cm =

2019 cm	9.48 m	38.58 m	38.58 m	969 km
______	______	______	______	______

4.9 cm	84.47 cm	5.39 km	5.39 km	84.47 cm	9.48 m
______	______	______	______	______	______

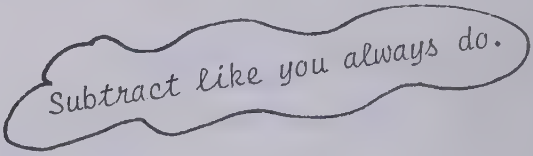
SUBTRACTION

Example A:

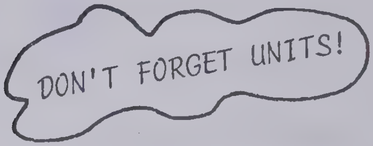
$$\begin{array}{r} 13\text{ m} \\ -\ 9\text{ m} \\ \hline 4\text{ m} \end{array}$$

Example B:

$$\begin{array}{r} 38.25\text{ cm} \\ -17.13\text{ cm} \\ \hline 21.12\text{ cm} \end{array}$$


Subtract like you always do.

KEEP UNITS TOGETHER!


DON'T FORGET UNITS!

3. Subtract:

(a) $\begin{array}{r} 38\text{ mm} \\ -14\text{ mm} \\ \hline \end{array}$ (b) $\begin{array}{r} 46.55\text{ cm} \\ -13.22\text{ cm} \\ \hline \end{array}$ (c) $\begin{array}{r} 89.48\text{ cm} \\ -39.21\text{ cm} \\ \hline \end{array}$ (d) $\begin{array}{r} 203.9\text{ mm} \\ -101.7\text{ mm} \\ \hline \end{array}$

(e) $\begin{array}{r} 89.98\text{ km} \\ -75.26\text{ km} \\ \hline \end{array}$ (f) $\begin{array}{r} 994.46\text{ km} \\ -671.0\ \ \text{ km} \\ \hline \end{array}$ (g) $\begin{array}{r} 14.92\text{ m} \\ -10.8\ \ \text{ m} \\ \hline \end{array}$

4. Subtract:

(a)
$$\begin{array}{r} \overset{9}{\cancel{10}}.\overset{10+4=14}{4}\text{ cm}\\ -5.9\text{ cm}\\ \hline 4.5\text{ cm}\end{array}$$

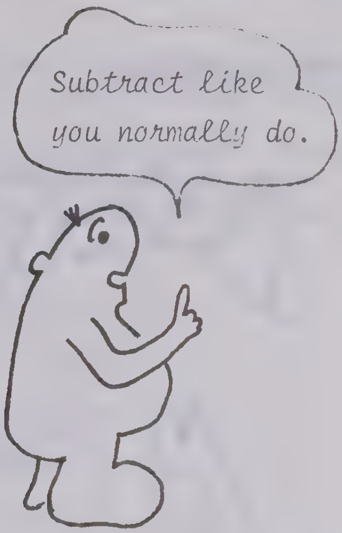
(b)
$$\begin{array}{r} \overset{24}{\cancel{25}}.\overset{10+3=13}{3}\text{ cm}\\ -13.9\text{ cm}\\ \hline 11.4\text{ cm}\end{array}$$

(c)
$$\begin{array}{r} 27.3\text{ cm}\\ -20.9\text{ cm}\\ \hline \end{array}$$

(d)
$$\begin{array}{r} 54.4\text{ cm}\\ -33.8\text{ cm}\\ \hline \end{array}$$

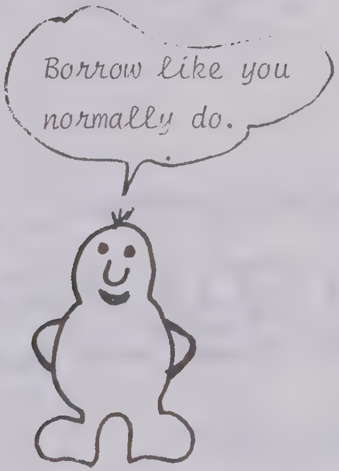
(e)
$$\begin{array}{r} 29.1\text{ cm}\\ -19.6\text{ cm}\\ \hline \end{array}$$

(f)
$$\begin{array}{r} 84.0\text{ m}\\ -31.7\text{ m}\\ \hline \end{array}$$


Subtract like you normally do.

✓ Yourself

(c) 6.4 cm
(d) 20.6 cm
(e) 9.5 cm
(f) 52.3 m


Borrow like you normally do.

5. Subtract:

(a)
$$\begin{array}{r} 97.44\text{ m}\\ -85.90\text{ m}\\ \hline \end{array}$$

(b)
$$\begin{array}{r} 135.16\text{ m}\\ -\ 16.89\text{ m}\\ \hline \end{array}$$

(c)
$$\begin{array}{r} 257.1\text{ cm}\\ -142.9\text{ cm}\\ \hline \end{array}$$

(d)
$$\begin{array}{r} 852.0\text{ m}\\ -630.48\text{ m}\\ \hline \end{array}$$

(e)
$$\begin{array}{r} 184.94\text{ km}\\ -\ 31.982\text{ km}\\ \hline \end{array}$$

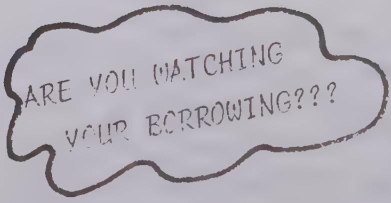
(f)
$$\begin{array}{r} 45.5\text{ km}\\ -41.7\text{ km}\\ \hline \end{array}$$

(g)
$$\begin{array}{r} 65.492\text{ km}\\ -30.105\text{ km}\\ \hline \end{array}$$

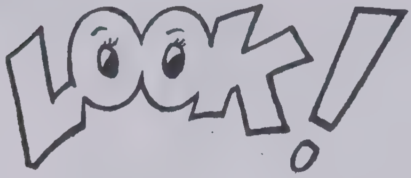
(h)
$$\begin{array}{r} 88.681\text{ km}\\ -44.945\text{ km}\\ \hline \end{array}$$

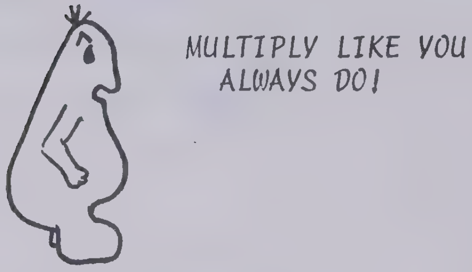
(i)
$$\begin{array}{r} 95.2\ \ \text{ km}\\ -87.482\text{ km}\\ \hline \end{array}$$

(j)
$$\begin{array}{r} 304.0\text{ cm}\\ -\ 14.8\text{ cm}\\ \hline \end{array}$$


ARE YOU WATCHING YOUR BORROWING???

MULTIPLICATION:

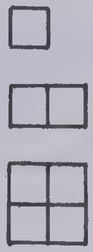



MULTIPLY LIKE YOU ALWAYS DO!

A. How many one cm by one cm squares are there? ______

B. Multiply 2 cm x 4 cm = ______ sq cm.

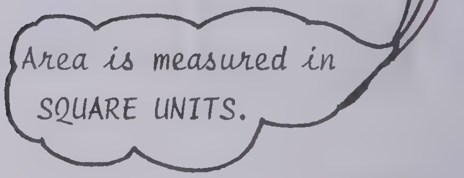
C. Area of square is 8 square cm or 8 cm^2



Note: 1 cm x 1 cm = 1 cm^2

1 cm x 2 cm = 2 cm^2

2 cm x 2 cm = 4 cm^2


Area is measured in SQUARE UNITS.

Keep units together.

6. Multiply:

(a) 3 mm x 15 mm = ______ sq cm

(b) 28 cm x 42 cm = ______ sq cm

(c) 64 cm x 14 cm = ______ cm^2

(d) 129 m x 38 m = ______ m^2

(e) 218 m x 406 m = __________

(f) 58 km x 20 km = __________

(g) 85 km x 64 km = __________

(h) 265 mm x 45 mm - __________

7. *TREASURE ROOM*

Test your knowledge: Each room in the following maze contains a number. Fifteen of these numbers are the correct answers to the problems below.

Worky any problem and find your answer in the maze. Circle your answer. Keep working problems until you can draw a path to the treasure room that goes only through rooms containing the correct answers. (Not all rooms are on the correct path.)

(a) 30 cm x 20 cm = _____ sq cm

(b) 18 mm x 15 mm = _____ sq mm

(c) 12 km x 7 km = _____ km^2

(d) 6 cm x 18 cm = _____ cm^2

(e) 10 km x 38 km = _____ km^2

(f) 27 cm x 10 cm = _____ cm^2

(g) 28 cm x 14 cm = _____ cm^2

(h) 39 cm x 2 cm = _____ cm^2

(i) 54 km x 39 km = _____ km^2

(j) 50 mm x 20 mm = _____ mm^2

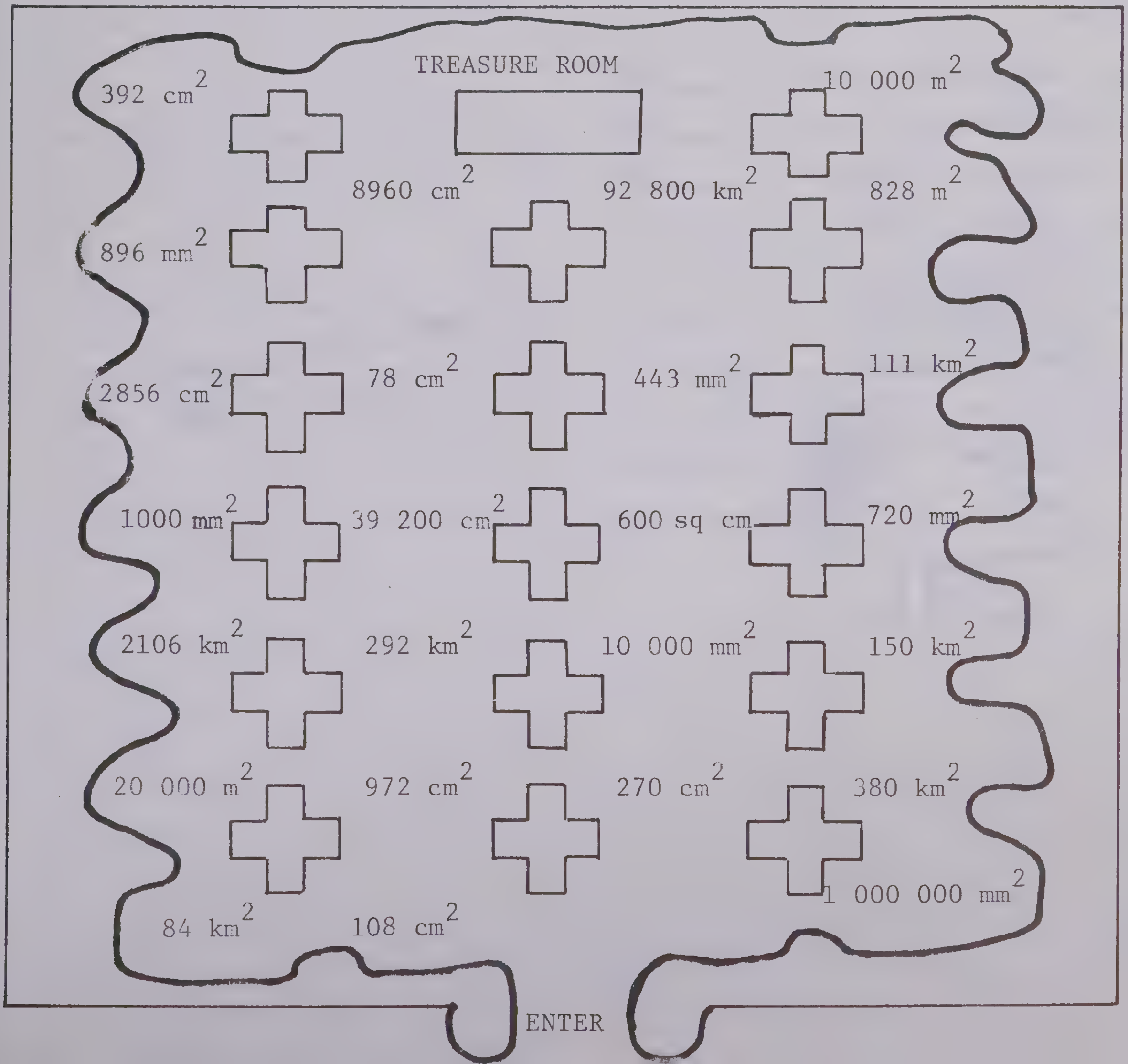
(k) 200 m x 100 m = _____ m^2

(l) 84 cm x 34 cm = _____ cm^2

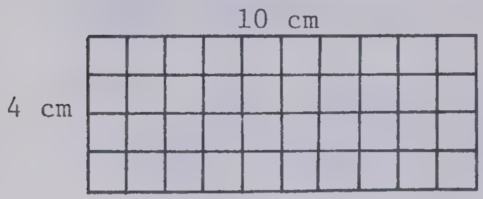
(m) 18 m x 46 m = _____ m^2

(n) 6 km x 25 km = _____ km^2

(o) 64 mm x 14 mm = _____ mm^2



DIVISION



Count the squares.

Area = ______ sq cm or cm^2

If one side is 10 cm the other side is __________

$40\ cm^2 \div 10\ cm = 4\ cm$

Notice units are the same.

8. Divide:

(a) 2800 sq mm ÷ 28 mm = ______mm

(b) 9632 sq cm ÷ 32 cm = ______cm

(c) $1786\ km^2 \div 38\ km$ = ________km

(d) $2856\ m^2 \div 84m$ = ____________

(e) $1152\ cm^2 \div 18\ cm$ = __________

(f) $2304\ mm^2 \div 6\ mm$ = ___________

(g) $414\ m^2 \div 18\ m$ = _____________

(h) $1000\ mm^2 \div 10\ mm$ = __________

(i) $7568\ km^2 \div 88\ km$ = __________

(j) $2072m^2 \div 74\ m$ = _____________

✸ DID YOU REMEMBER THE UNITS? ✸

9. DAFFYNITIONS:

"WHAT DO PEOPLE GET FROM EATING BETWEEN MEALS?"

Match the letters to the numbers below to get the correct answer to the riddle.

I 6794 sq cm ÷ 86 cm = ______ cm

R 3332 sq m ÷ 49 m = ________ m

S 2673 sq mm ÷ 27 mm = ______ mm

E 8722 cm^2 ÷ 89 cm = __________

A 6324 cm^2 ÷ 68 cm = __________

D 1316 mm^2 ÷ 28 mm = __________

N 22 752 mm^2 ÷ 32 mm = ________

W 2457 m^2 ÷ 39 m = ____________

H 6840 cm^2 ÷ 90 cm = __________

C 780 m^2 ÷ 10 m = _____________

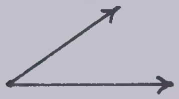
P 4268 km^2 ÷ 44 km = __________

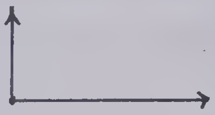
___ ___ ___ ___ ___ ___ ___ ___
99 93 711 47 63 79 78 76

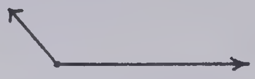
___ ___ ___ ___ ___ ___
99 97 68 98 93 47

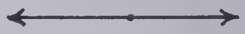
DEFINITION OF AN ANGLE: *Two rays with a common endpoint.*

Examples:









Each of the rays is called an ARM.

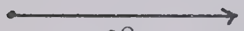
The point where the rays meet is the VERTEX.

The unit of measure of an angle is the DEGREE.

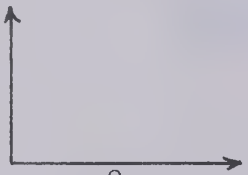
360 degrees is a full circle. (Symbol: 360°)

By looking at an angle, you should be able to guess its size in degrees.

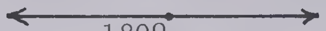
Easy angles to guess:



0°

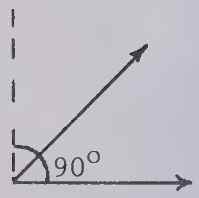


90°

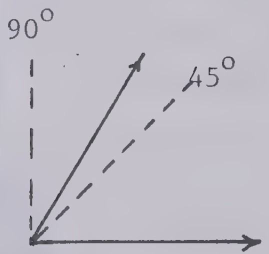


180°

Using the easy angles, you can guess other angles:



The dotted line shows 90°, so half of this would be 45°.



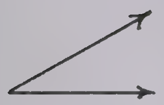
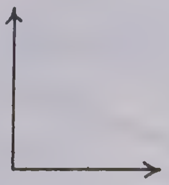
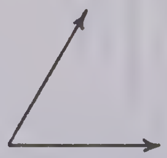
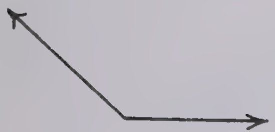
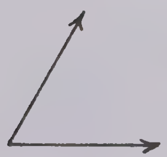
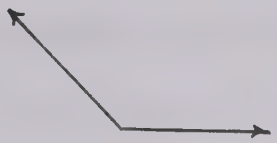
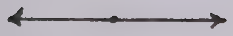
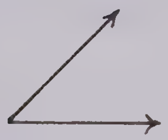
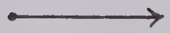
A good guess for this angle would be 60°, since it is nearly halfway between 45° and 90°.

1. Look at the angles below. Guess the measure of each angle using the list at the right.
Place the letter which matches your guess under the angle.
When you have finished you should have a simple statement of fact.

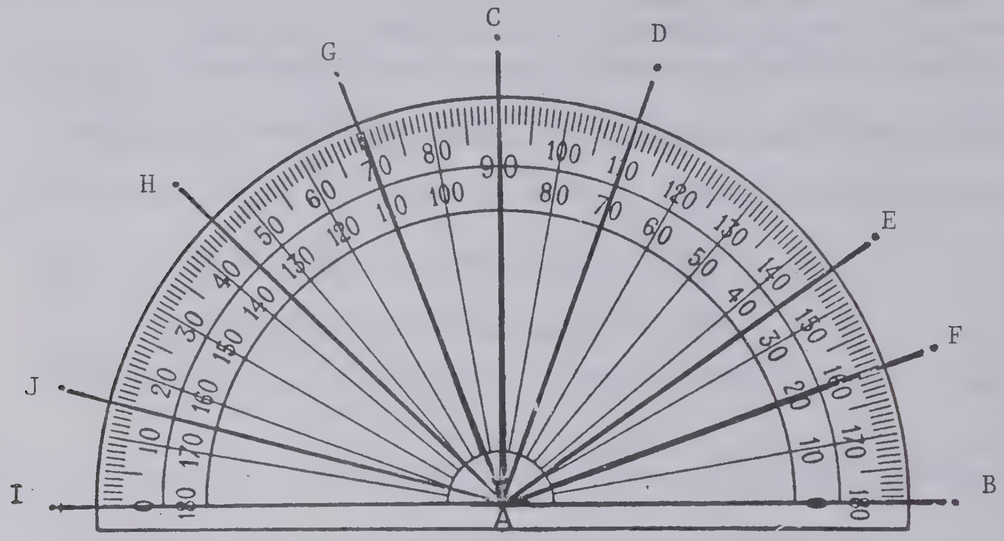
Reminder... use 90° as a guide. 90° looks like a square corner.

Some letters are used twice.

0°	N
30°	T
45°	U
60°	I
90°	H
135°	S
180°	F

MEASURING ANGLES



To measure an angle using a *PROTRACTOR:*

1. Place the cross (marked "A" in the drawing) on the *VERTEX* of the angle.

2. Position the protractor so that one of the *ARMS* lies along the zero line.

3. Examine the *SECOND ARM* of the angle to see where it passes through the protractor's scale. This number tells you the size of the angle in degrees.

360 degrees in symbols: 360^{0}
360^{0} = *1 full circle*
180^{0} = *1/2 circle*
90^{0} = *a right angle*

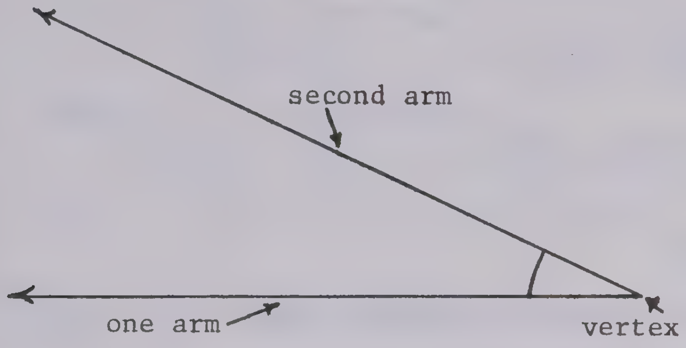
2. Use the drawing to answer the following example: ∠ IAJ = 15 degrees

(a) ∠ IAH = ______degrees
(b) ∠ IAG = ______degrees
(c) ∠ IAC = ______degrees
(d) ∠ IAD = ______^{o}
(e) ∠ IAE = ______^{o}
(f) ∠ IAF = ______^{o}
(g) ∠ IAB = ______^{o}

A = vertex
I = zero line
J = 15 mark on scale

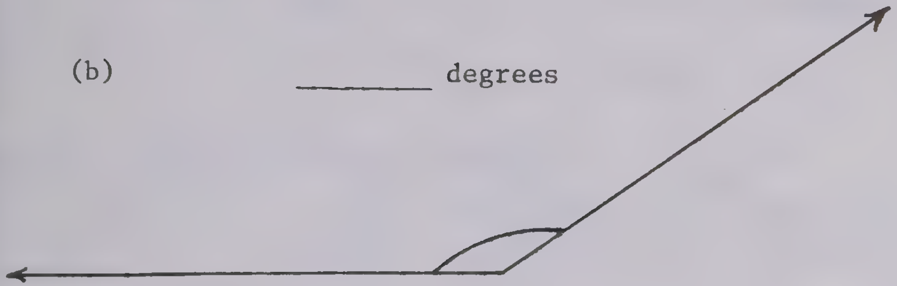
3. Use your protractor to measure the following angles:

(a) __________ degrees

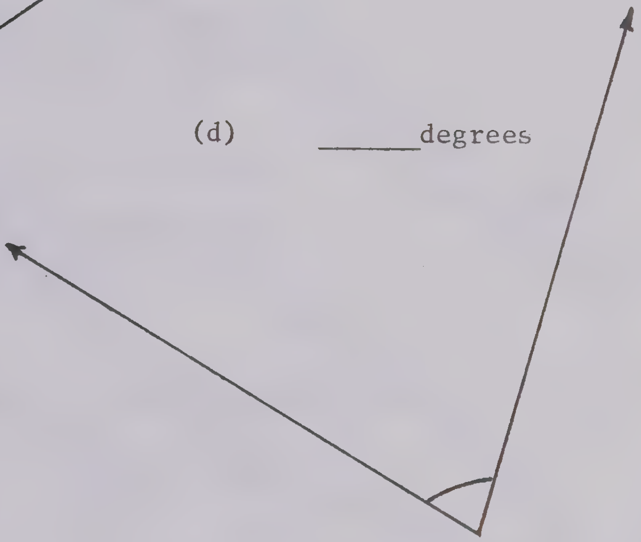


REMEMBER...
- *place the cross at the VERTEX.*
- *place the zero line on one ARM*
- *read from the scale where the other arm crosses the protractor.*

(b) ________ degrees

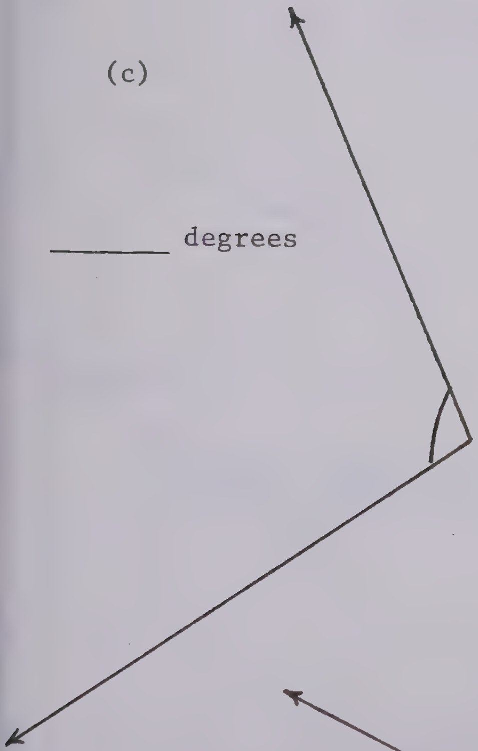


(d) ______ degrees

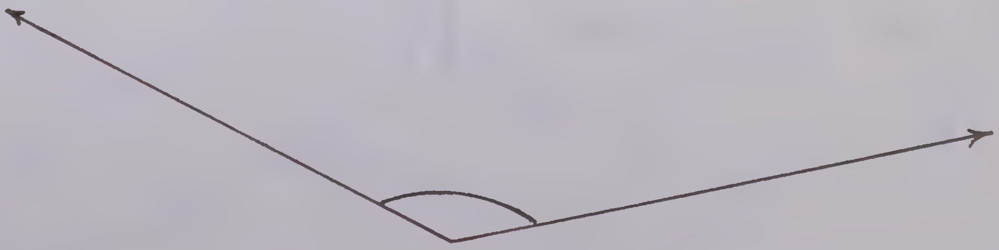


(c)

_______ degrees



(e) _______ degrees



3. (f) _______ degrees

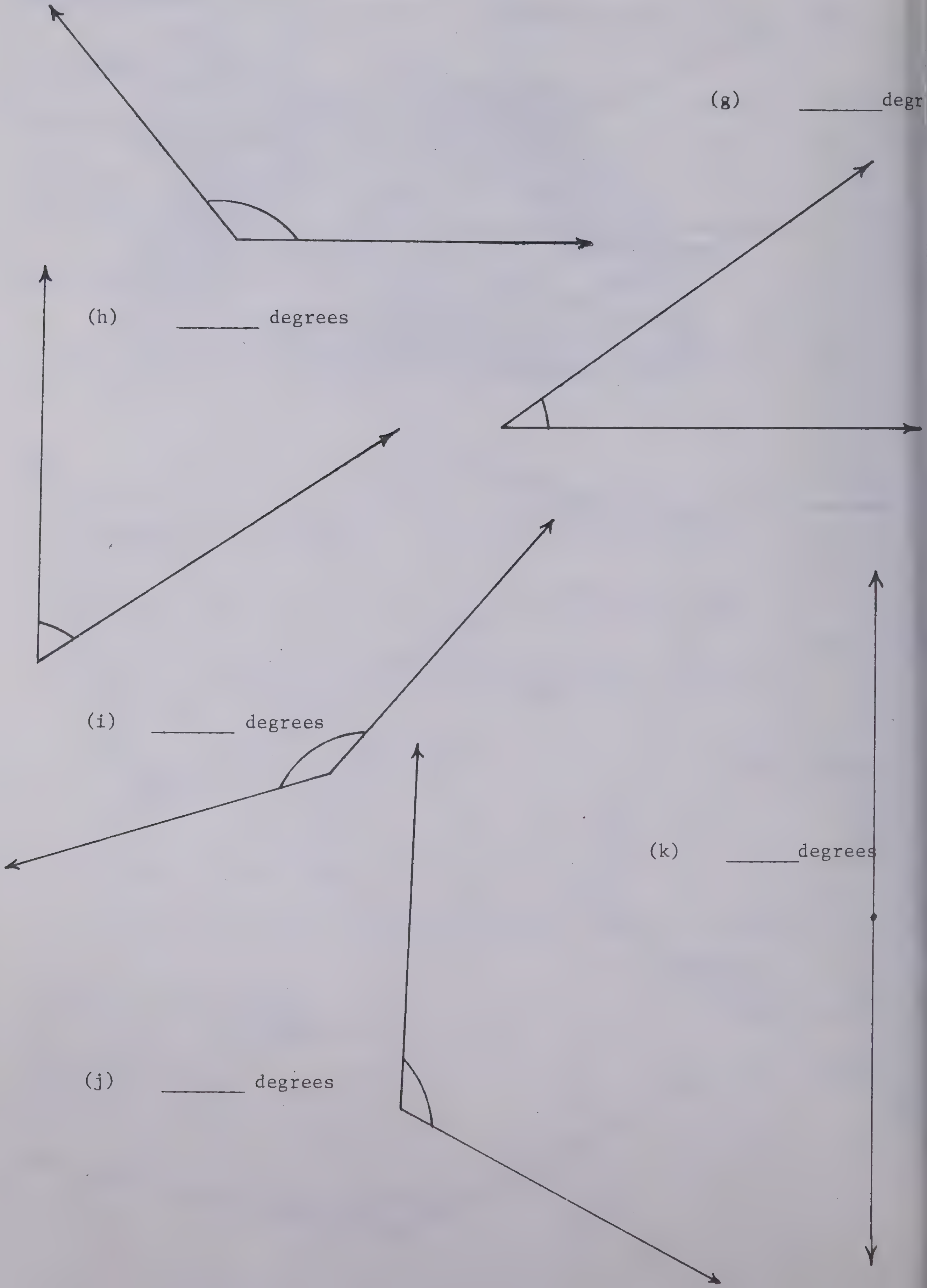
(g) _______degr

(h) _______ degrees

(i) _______ degrees

(j) _______ degrees

(k) ______degrees



4.

CRAZY ANSWERS

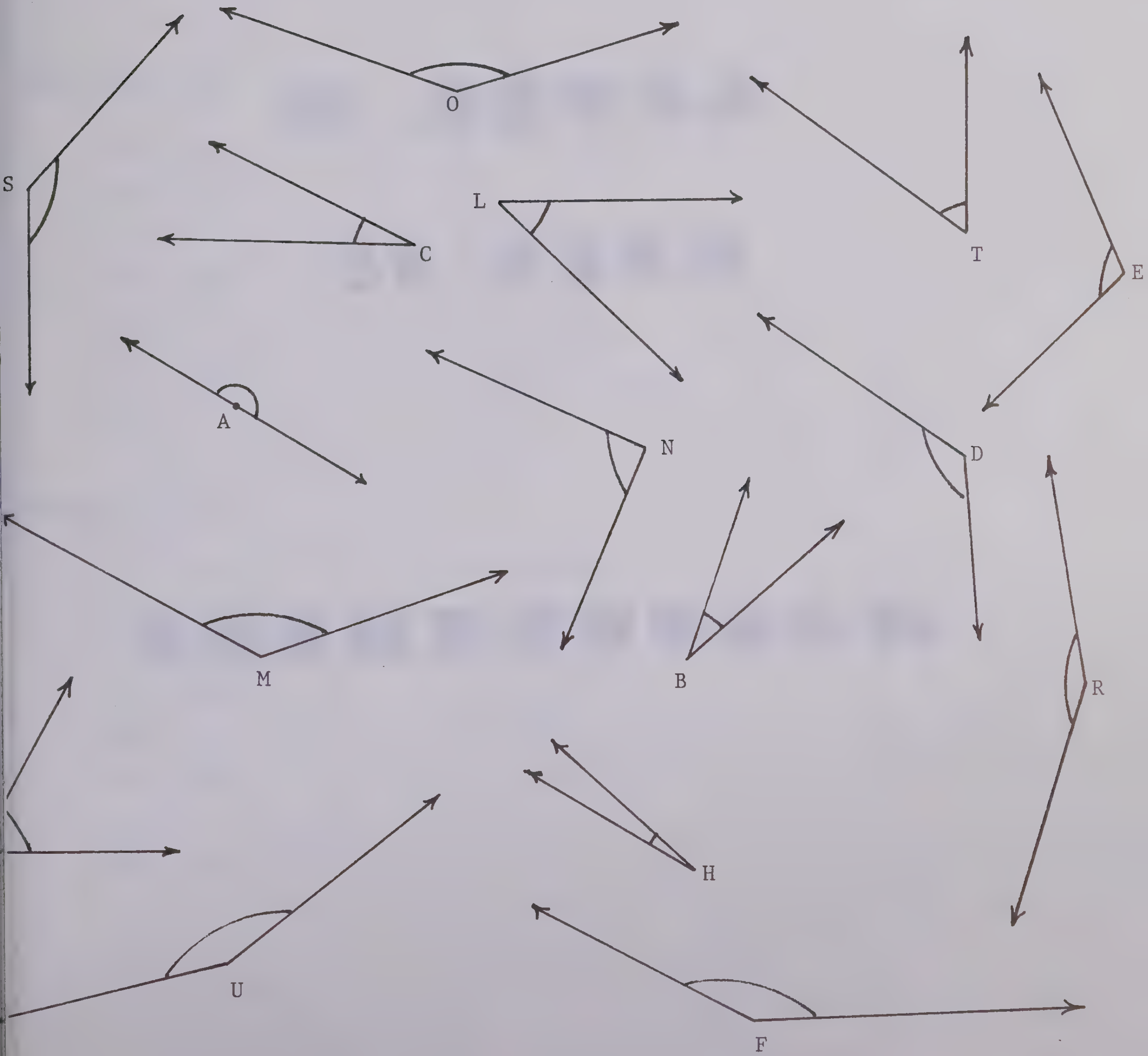
To find the answers to the following questions, measure any angle below and find your answer in the code. Each time the answer appears in the code, write **the vertex** letter of that angle above the correct number.

(a) *What do you do to a mountain?*
25° 45° 60° 133° 180° 53° 110°

(b) *Who is a man who is crazy about money?*
128° 145° 90° 155° 53°

(c) *What do you call a chief's daughter?*
133° 60° 138° 25° 11° 60° 110° 150°

(d) *What do you call the rear part of a cafeteria?*
30° 180° 25° 53° 110° 153° 60° 180°



KEY TO EXERCISES

LEVEL 8

UNIT II

MEASUREMENT

KEY TO EXERCISES

Objective No. B-1

1\.
(a) 40
(b) 25
(c) 20
(d) 24
(e) 22
(f) 26
(g) 42

2\.
(a) 35
(b) 48
(c) 48
(d) 15
(e) 40
(f) 33

3. "School is cool."

Objective No. B-2

1\.
(b) 6 cm^2
(c) 8 cm^2

2\.
(a) 4 km^2
(b) 9 m^2
(c) 8 mm^2
(d) 6 cm^2
(e) 11 km^2
(f) 12 m^2
(g) 16 cm^2
MESSAGE: "END"

Objective No. B- 5

1\.
(a) 80 cm
(b) 129 mm
(c) 112 m
(d) 1039 m
(e) 1780 mm
(f) 633 km
(g) 656 mm
(h) 1768 km
(i) 792 cm
(j) 87.57 cm
(k) 88.00 km
(l) 113.39 cm
(m) 175.32 km
(n) 113.32 cm
(o) 563.22 m
(p) 94.63 km
(q) 182.30 m
(r) 201.12 m

2. Riddle Math: "Blood vessel"

Objective No. B 5 - cont'd.

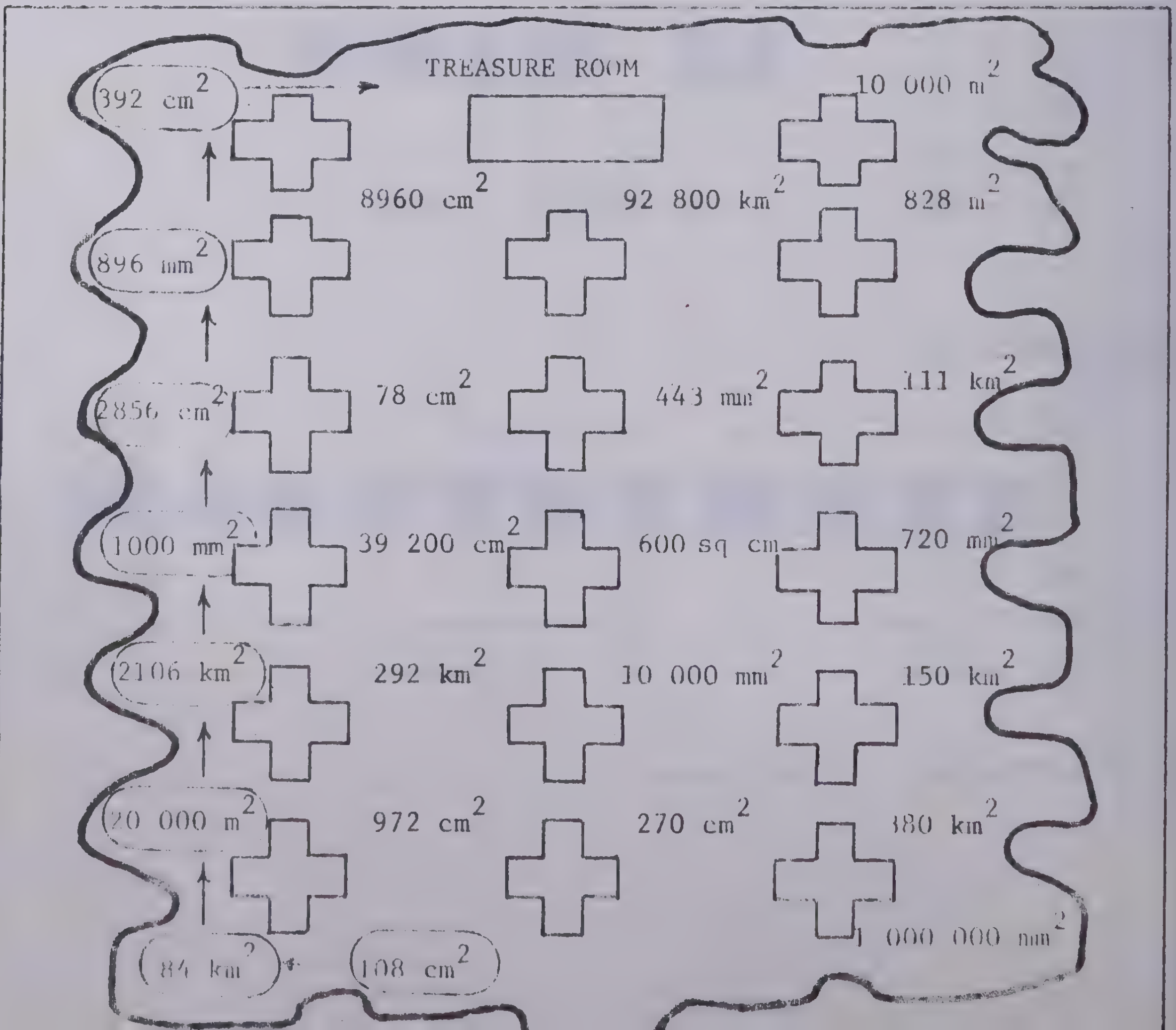
3. (a) 24 mm
(b) 33.33 cm
(c) 50.27 cm
(d) 102.2 mm
(e) 14.72 km
(f) 323.46 km
(g) 4.12 m

4. Self check.

5. (a) 11.54 m
(b) 118.27 m
(c) 114.2 cm
(d) 221.52 m
(e) 152.958 km
(f) 3.8 km
(g) 35.387 km
(h) 43.736 km
(i) 7.718 km
(j) 289.2 cm

6. (a) 45 sq cm
(b) 1176 sq cm
(c) 896 cm^2
(d) 4902 m^2
(e) 88 508 m^2
(f) 1160 km^2
(g) 5440 km^2
(h) 11 925 mm^2

7.



Key to Exercises

Objective No. B - 5 - cont'd.

8. (a) 100 mm
(b) 301 cm
(c) 47 km
(d) 34 m
(e) 64 cm
(f) 384 mm
(g) 23 m
(h) 100 mm
(i) 86 km
(j) 28 m

9. DAFFYNITION: "Sandwich Spread"

Objective No. C - i

1. "This is fun."

2. (a) 45°
(b) 70°
(c) 90°
(d) 110°
(e) 135°
(f) 160°
(g) 180°

3. (a) 25°
(b) 145°
(c) 100°
(d) 75°
(e) 140°
(f) 130°
(g) 35°
(h) 145°
(i) 55°
(j) 115°
(k) 180°

3. CRAZY ANSWERS:
(a) Climate
(b) Donut
(c) Mischief
(d) Bacteria

GEOMETRY

LEVEL 8

UNIT III

CONTENTS

Unit III - Geometry

PAGE

OBJECTIVE 5: State that .... 254.
(i) a slide reflection is a combination of a slide and a reflection.
(ii) an original and its image are congruent with respect to the whole figure as well as the various parts.

OBJECTIVE 6: Define the terms regular and diagonal as applied to polygons. .... 258.

OBJECTIVE 8: Difine acute, obtuse and right angles. .... 261.

OBJECTIVE 9: Classigy triangles by their angles. .... 265.

OBJECTIVE 10: Classify triangles by their sides. .... 270.

OBJECTIVE 14: Determine the angle sum of a triangle. (Glide the angles to become a line.) .... 277.

OBJECTIVE 16: Identify pairs of angles. (Limit: supplementary, complementary, linear, opposite, and adjacent.) .... 283.

OBJECTIVE 17: Determine the properties of the angles formed by two parallel lines and a transversal. (Eg. use a slide and a half-turn.) (Limit: corresponding, alternate). .... 289.

OBJECTIVE 18: Develop a formula for the perimeter of any polygon. (e.g. P = sum of sides.) .... 294.

OBJECTIVE 19: Sketch a required altitude given a triangle or a quadrilateral. .... 297.

OBJECTIVE 25 : Solve perimeter and area problems for various triangles and quadrilaterals given diagrams or word problems. (Recognize standard form of formulas; note the similarity between formulas and other conditions, solve for radius, length, etc.) .... 308.

Unit III - Geometry (cont'd)

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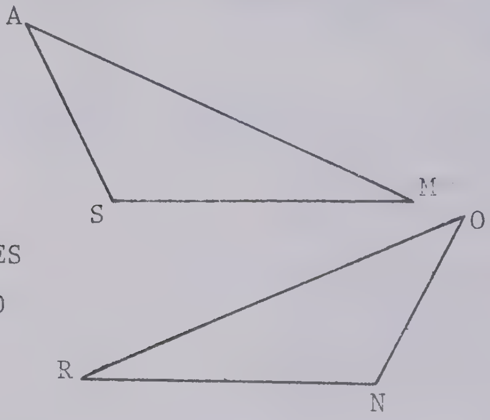
OBJECTIVE 28: Solve circumference and area problems for circles given diagrams or word problems. .... 327.

KEY TO EXERCISES .... 342.

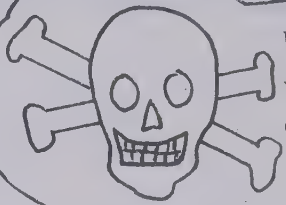
1. Below are the figures SAM and its image RON. By tracing check to see if SAM and RON are congruent. Draw a star around your answer.

(a)



YES

NO

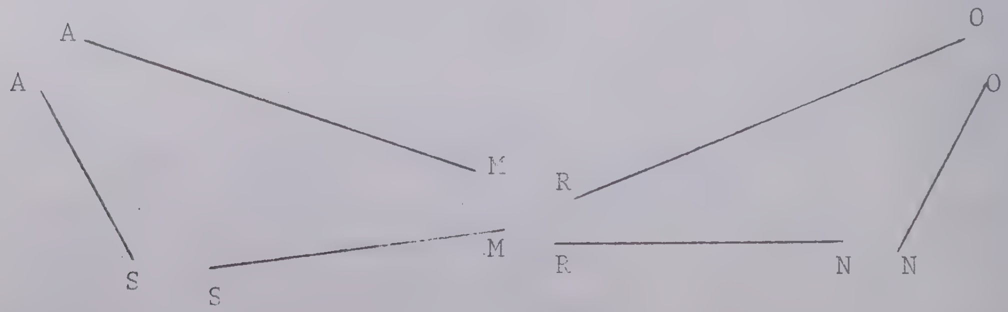


WARNING!!

You may have to turn or flip the tracing.

REMEMBER ... Two things are congruent if one fits on the other

I have cut SAM and RON into parts. Tell me if the parts are still congruent. Answer by drawing ☺ around the correct answer.



(b) SA and NO YES NO

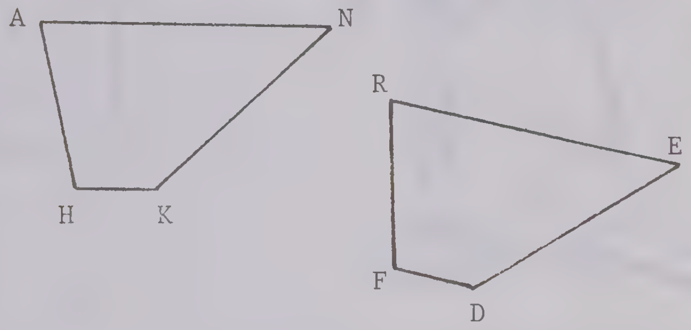
(c) AM and RO YES NO

(d) MS and RN YES NO

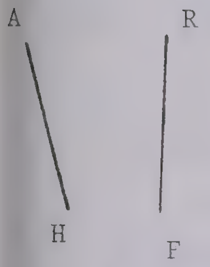
2.

Below are the figures HANK and its image FRED. By tracing tell whether the following are congruent.

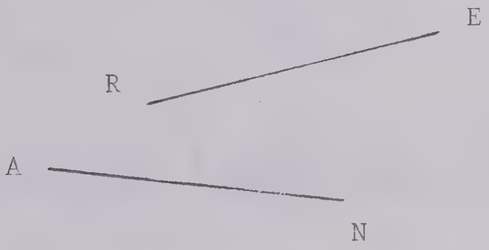
(a) YES NO



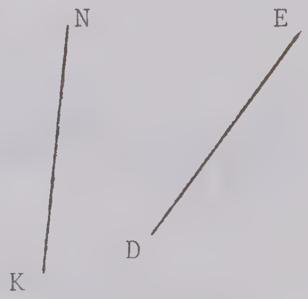
(b) YES NO



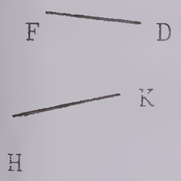
(c) YES NO

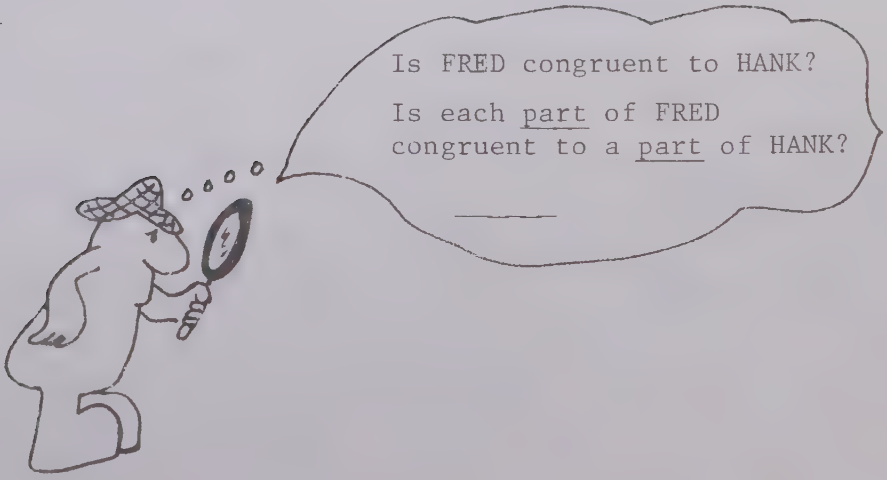


(d) YES NO



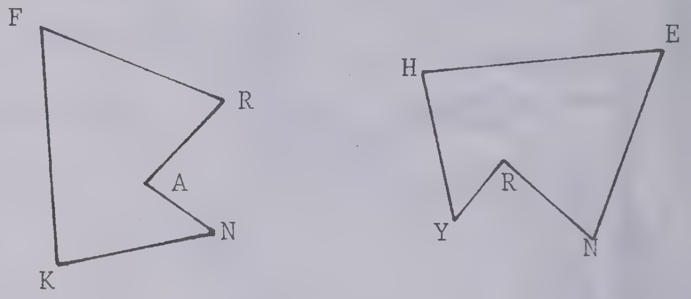
(e) YES NO




Is FRED congruent to HANK?
Is each part of FRED congruent to a part of HANK?

3.

Henry is an image of FRANK. By tracing determine which segments of HENRY are congruent to each segment of FRANK.

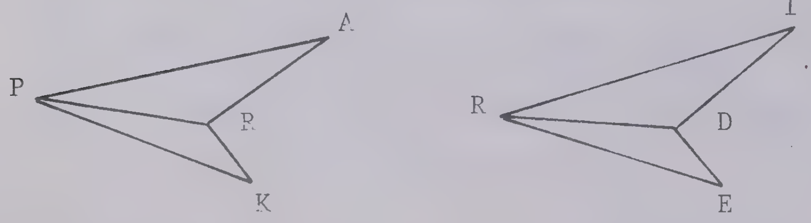


(a) FR ≅ EN (b) RA ≅ ___ (c) AN ≅ ___ (d) NK ≅ ___

(e) KF ≅ ___

≅ means "congruent to"

4. RIDE is an image of PARK. Following are a number of statements. Circle the answer and letter which tells whether each statement is true (T) or false (F).



Place the circled letter in the numbered spaces at the bottom of the next page.

	(T)	(F)	SPACE
(a) PA ≅ RI	o	a	3
(b) PK ≅ RE	e	f	12
(c) AR ≅ DE	d	e	15
(d) ID ≅ AR	o	p	7

4.

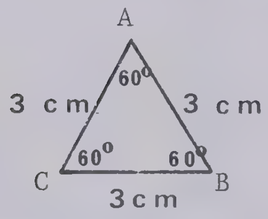
(e)	PR $\cong$ RD	(T) g	(F) h	---------------- 9
(f)	PA $\cong$ RE	(T) w	(F) v	---------------- 4
(g)	ΔPAR $\cong$ ΔRDE	(T) b	(F) c	--------------- 14
(h)	RK $\cong$ DE	(T) e	( ) f	--------------- 5
(i)	ΔPRK $\cong$ ΔRID	(T) p	(F) r	--------------- 10
(j)	PK $\cong$ RI	(T) m	(F) n	--------------- 13
(k)	ΔPAR $\cong$ ΔRID	(T) i	(F) j	--------------- 1
(l)	ΔPRK $\cong$ ΔRDE	(T) u	(F) r	--------------- 11
(m)	PARK $\cong$ RIDE	(T) l	(F) m	--------------- 2
(n)	DE $\cong$ PR	(T) m	(F) n	--------------- 8
(o)	KP $\cong$ RE	(T) c	(F) d	--------------- 6

___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

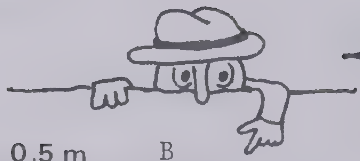
Regular Polygons

A REGULAR POLYGON is a polygon in which all sides have the same measure, and all angles have the same measure.

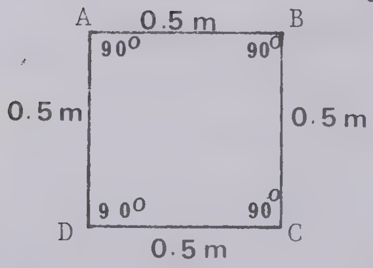
Example: ABC is a REGULAR POLYGON. Note that all the sides are congruent and all the angles are congruent.



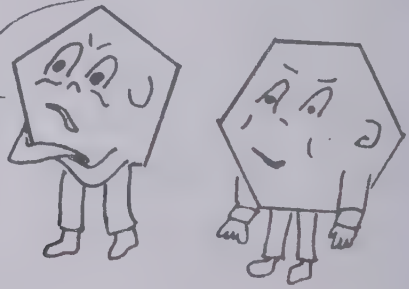
This regular polygon has a special name. It is called an EQUILATERAL TRIANGLE.



This is another example of a REGULAR POLYGON. Its special name is SQUARE.



Why don't the rest of us get special names??



Don't worry about it. Just remember! ANY polygon with congruent sides and congruent angles is called a REGULAR POLYGON!

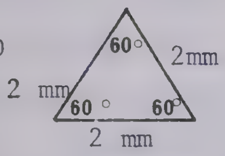
5. Who holds the record for most home runs in the major baseball leagues?

To find the answer to this question, follow these directions:

Study the polygons below. If they are regular, circle the top letter. If they are not regular, circle the bottom letter. The letters that are circle will give the correct answer.

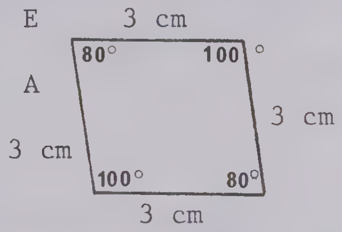
(a) H

O



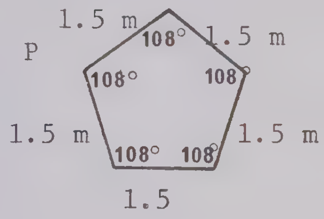
(b) E

A



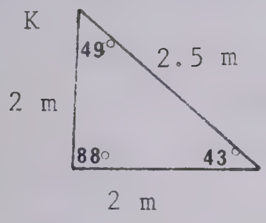
(c) N

P



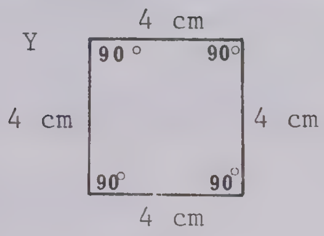
(d) O

K



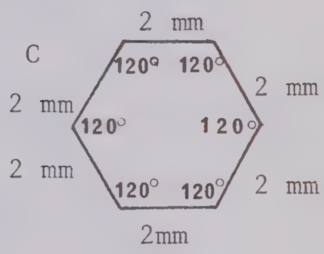
(e) A

Y



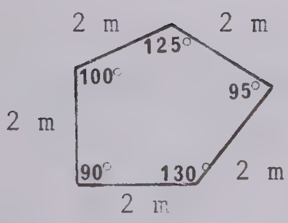
(f) A

C



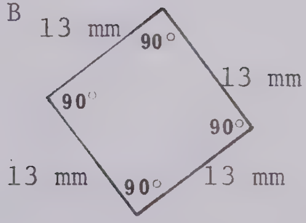
(g) S

R



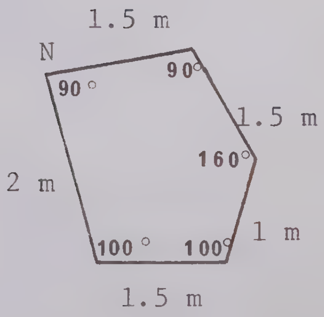
(h) O

B

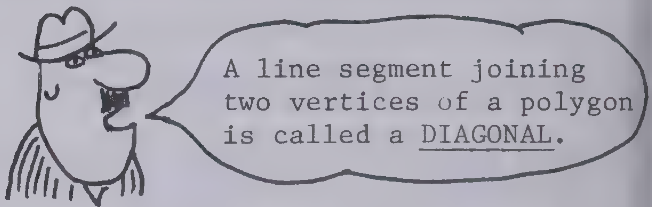


(i) D

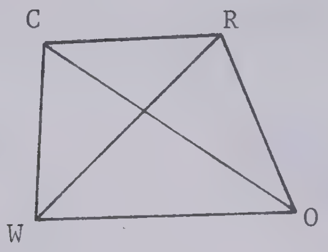
N



Diagonals of a Polygon


A line segment joining two vertices of a polygon is called a DIAGONAL.

Example: $\overline{CO}$ is a DIAGONAL. It joins vertices C and O and is not a side of CROW.



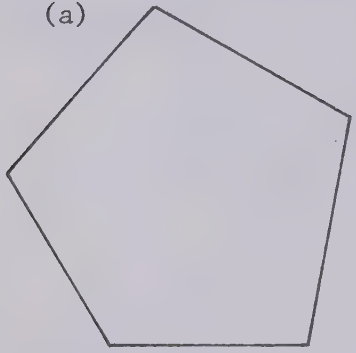
CAUTION: The side of a polygon is not a diagonal.

Can you name another diagonal of CROW? ______

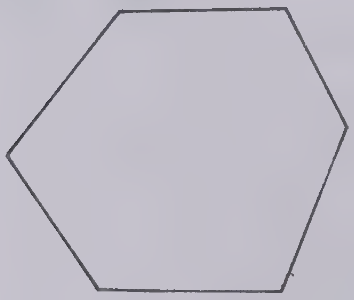
Is WO a diagonal? _____ Why not? ________________________

6. For each of the following polygons draw the diagonals.

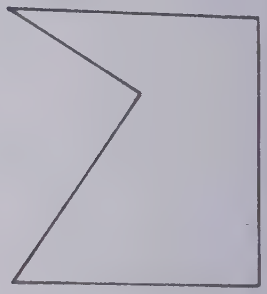
(a)



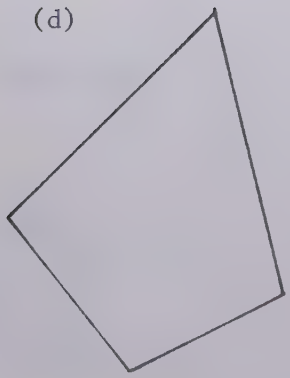
(b)



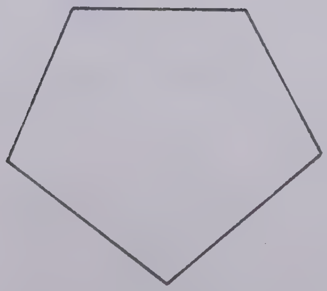
(c)



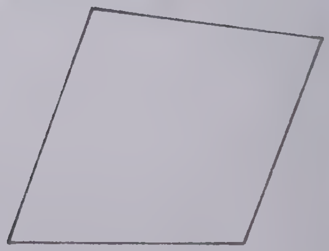
(d)



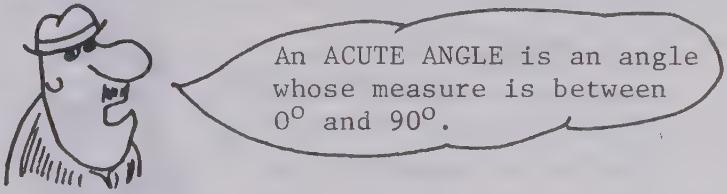
(e)



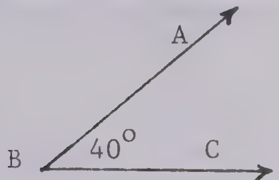
(f)



Acute Angles


An ACUTE ANGLE is an angle whose measure is between 0° and 90°.

Example: $\angle$ ABC is an ACUTE ANGLE since its measure is between 0° and 90°.



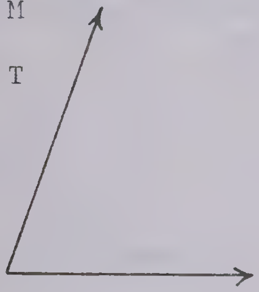
1. Who won the Stanley Cup the greatest number of times?

To find the answer to this question follow these directions:

Measure each of the following angles. If the angle is acute, circle the top letter. If the angle is not acute, circle the bottom letter. The letters that are circled will give the correct answer.

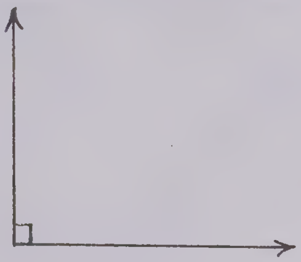
(a) M

T



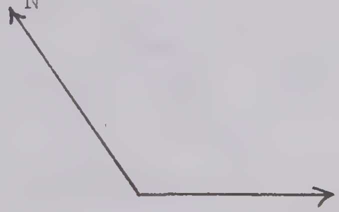
(b) A

O



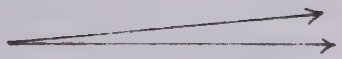
(c) R

N



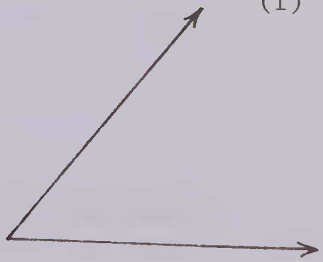
(d) T

O



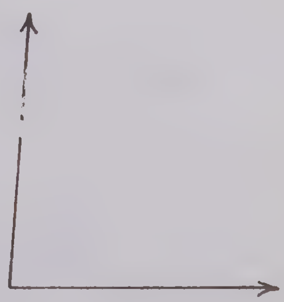
(e) R

N



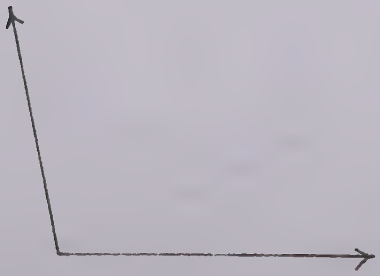
(f) E

O



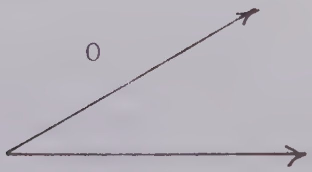
(g) T

A

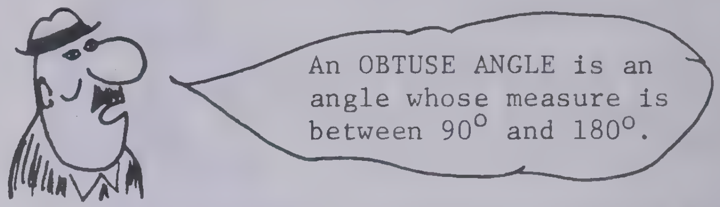


(h) L

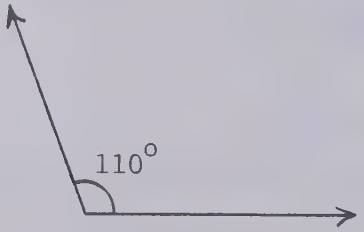
O



Obtuse Angles


An OBTUSE ANGLE is an angle whose measure is between 90° and 180°.

Example: ∠XYZ is an OBTUSE ANGLE since its measure is between 90° and 180°.



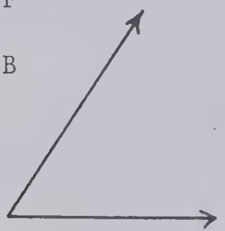
2. Name a player who scored more than 50 goals during one season in the N.H.L.

To find the answer to this question, follow these directions:

Measure each of the following angles. If the angle is obtuse cirle the top letter. If the angle is not obtuse circle the bottom letter. The letters that are circled will give the correct answer.

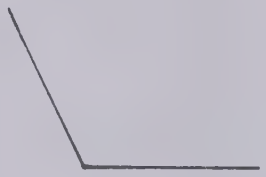
(a) F

B



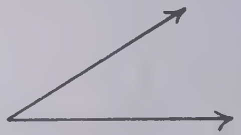
(b) O

R



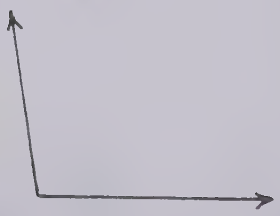
(c) A

B



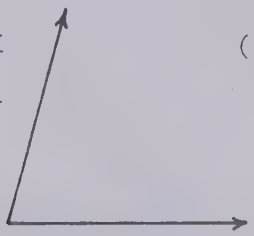
(d) B

N



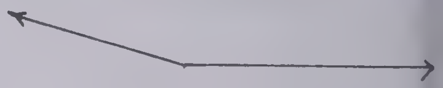
(e) K

Y



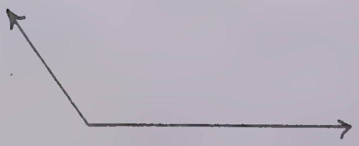
(f) H

P



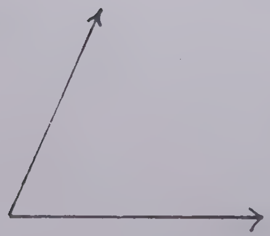
(g) U

A



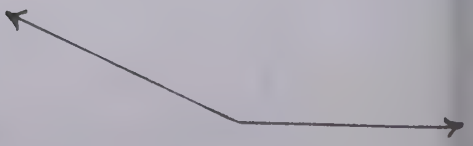
(h) R

L

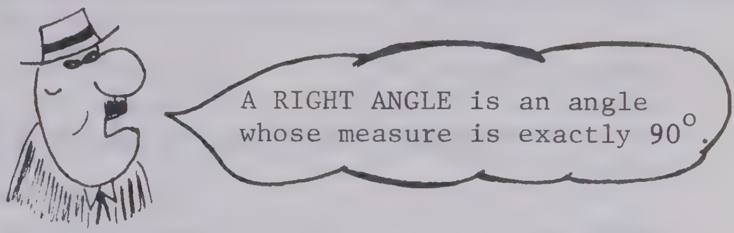


(i) L

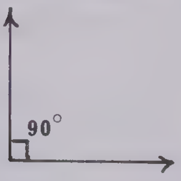
K



Right Angles


A RIGHT ANGLE is an angle whose measure is exactly 90°.

Example: ∠ ABC is a right angle since its measure is 90°.



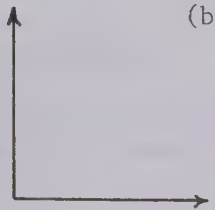
3. Who won the Grey Cup in 1975?

To find the answer to this question, follow these directions:

Measure each of the following angles. If the angle is a right angle, circle the top letter. If the angle is not a right angle, circle the bottom letter. The letters that are circled will give the correct answer.

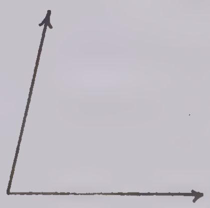
(a) E

W



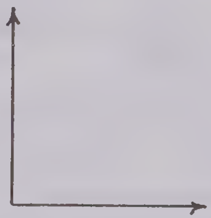
(b) I

D



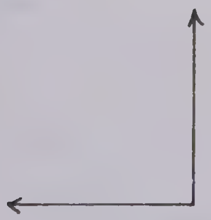
(c) M

N



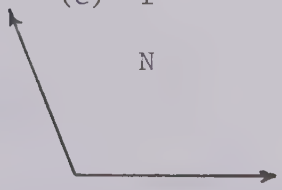
(d) O

N



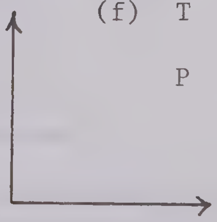
(e) I

N



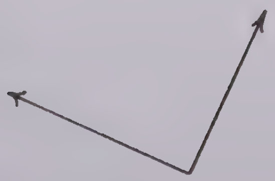
(f) T

P



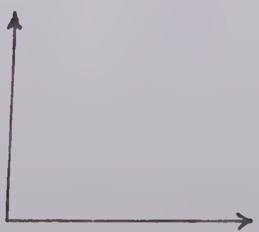
(g) O

E



(h) G

N

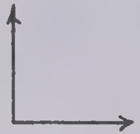


4. Review Exercise:

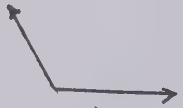
Write the correct letter from Column B to the left of the numbers in Column A.

COLUMN A

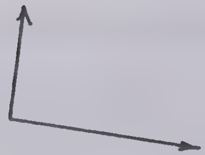
______ 1.



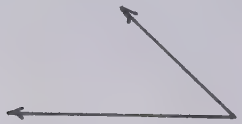
______ 2.



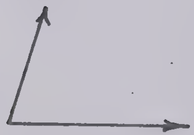
______ 3.



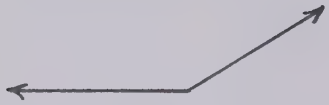
______ 4.



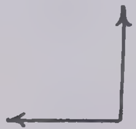
______ 5.



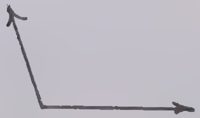
______ 6.



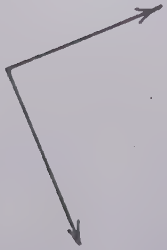
______ 7.



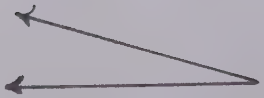
______ 8.



______ 9.



______ 10.

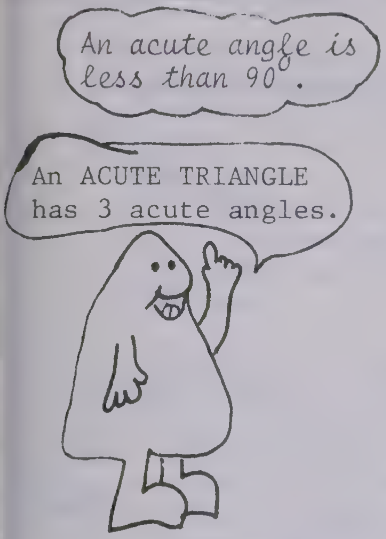


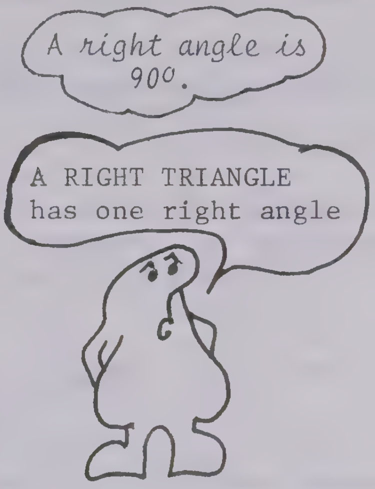
COLUMN B

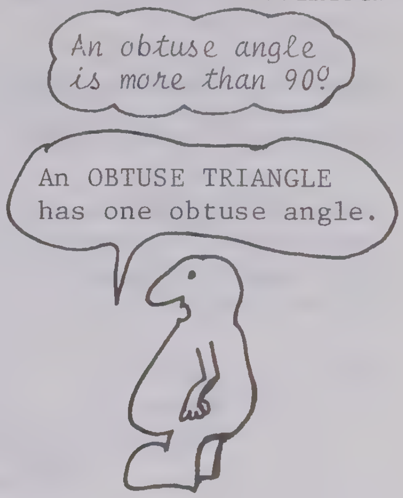
a. acute angle

b. right angle

c. obtuse angle


An acute angle is less than 90°.
An ACUTE TRIANGLE has 3 acute angles.

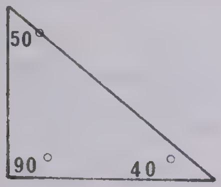

A right angle is 90°.
A RIGHT TRIANGLE has one right angle


An obtuse angle is more than 90°.
An OBTUSE TRIANGLE has one obtuse angle.

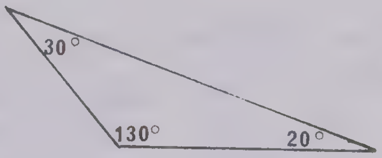
EXERCISES

1. Classify the following triangles according to their angles.

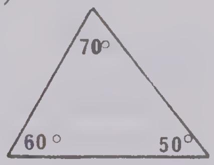
(a)



(b)

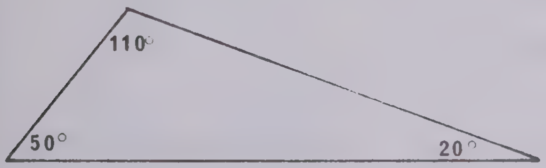


(c)



2. If a triangular window has two angles of 45° each and one angle of 90°, what type of triangle is it? ______________________

3. The plot of land below is used as a garden. What type of triangle is it?



____

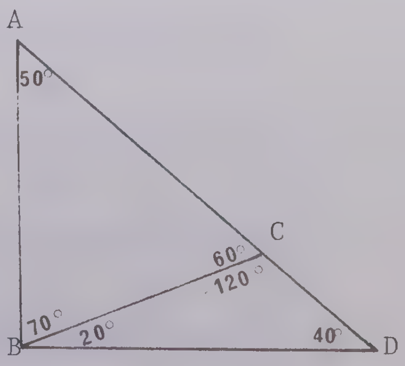
4. A square field is divided in half by making a fence from one corner of the field to its opposite corner. The two triangles created are ____________ triangles.

5. Classify:

(a) ΔABC ______________

(b) ΔBCD ______________

(c) ΔABD ______________

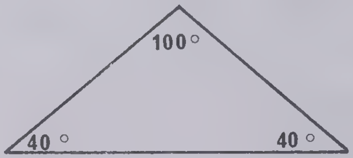


6. A CORNY JOKE! ....

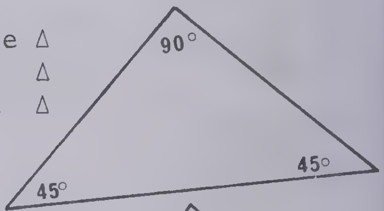
"WHAT MATHEMATICAL WORD DID THE LITTLE ACORN UTTER IN AMAZEMENT WHEN HE REALIZED HE HAD FINALLY GROWN UP?"

To find the answer to the above riddle choose the correct letter to represent the type of triangle in each diagram. Put that letter in the blank corresponding to the letter of the question at the bottom of the page.

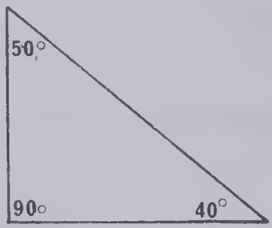
(a) G - obtuse Δ
E - right Δ
M - acute Δ



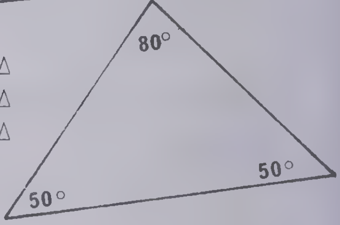
(e) G - obtuse Δ
E - right Δ
M - acute Δ



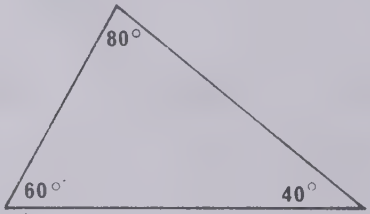
(b) G - obtuse Δ
E - right Δ
M - acute Δ



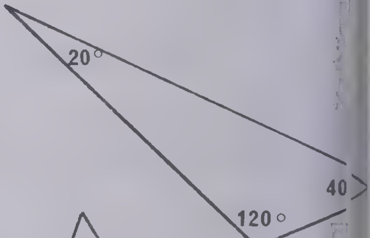
(f) T - acute Δ
O - obtuse Δ
P - right Δ



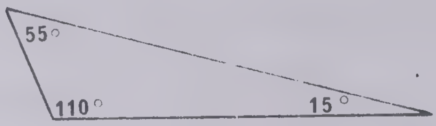
(c) T - obtuse Δ
O - acute Δ
P - right Δ



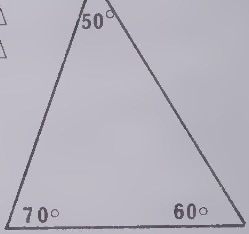
(g) T - acute Δ
A - right Δ
R - obtuse Δ



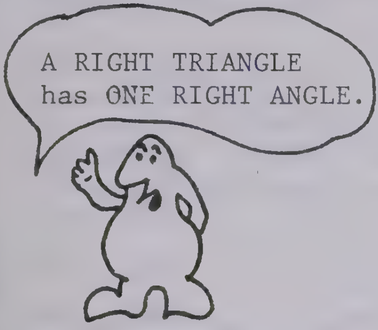
(d) G - right Δ
E - acute Δ
M - obtuse Δ

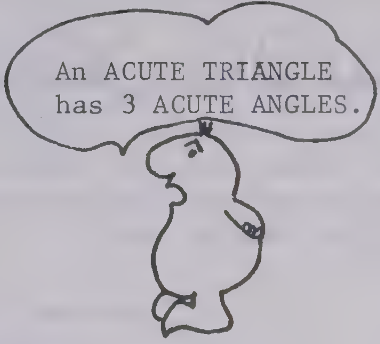


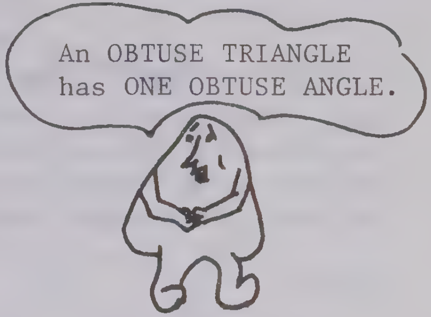
(h) T - right Δ
O - obtuse Δ
Y - acute Δ



___ ___ * ___ ___ * ___ * ___ ___ ___
a b c d e f g h


A RIGHT TRIANGLE has ONE RIGHT ANGLE.


An ACUTE TRIANGLE has 3 ACUTE ANGLES.


An OBTUSE TRIANGLE has ONE OBTUSE ANGLE.

7. DAFFYNITION: *"WHAT IS A FARMER?"*

(a) Below are the measures of the three angles of 35 triangles. Name each triangle according to those measures.
(b) Find the box containing the number of the question.
(c) If the answer in the box is RIGHT leave it as it is. If the answer is WRONG shade in the box.

The remaining boxes contain the answer to the question above.

1. 30°, 60°, 90°
2. 80°, 20°, 80°
3. 60°, 60°, 60°
4. 80°, 70°, 30°
5. 90°, 45°, 45°
6. 50°, 50°, 80°
7. 90°, 89°, 1°
8. 60°, 70°, 50°
9. 50°, 70°, 60°
10. 10°, 80°, 90°
11. 130°, 20°, 30°
12. 89°, 90°, 1°
13. 90°, 45°, 45°
14. 110°, 20°, 50°
15. 160°, 10°, 10°
16. 40°, 50°, 90°
17. 60°, 65°, 55°
18. 81°, 90°, 9°
19. 100°, 15°, 65°
20. 100°, 15°, 65°
21. 45°, 50°, 85°
22. 65°, 35°, 80°
23. 60°, 60°, 60°
24. 6°, 90°, 84°
25. 91°, 88°, 1°
26. 40°, 60°, 80°
27. 40°, 50°, 90°
28. 130°, 30°, 20°
29. 98°, 12°, 70°
30. 89°, 89°, 2°
31. 63°, 37°, 80°
32. 160°, 12°, 8°
33. 105°, 35°, 40°
34. 120°, 25°, 35°
35. 85°, 5°, 90°

Right Δ 1 A	Obtuse Δ 2 L	Right Δ 3 A	Acute Δ 4 M	Right Δ 5 A	Acute Δ 6 N	Obtuse Δ 7 S
Right Δ 8 P	Acute Δ 9 O	Right Δ 10 U	Obtuse Δ 11 T	Acute Δ 12 G	Obtuse Δ 13 E	Obtuse Δ 14 S
Obtuse Δ 15 T	Right Δ 16 A	Acute Δ 17 N	Right Δ 18 D	Acute Δ 19 Y	Obtuse Δ 20 I	Acute Δ 21 N
Acute Δ 22 G	Obtuse Δ 23 S	Obtuse Δ 24 T	Obtuse Δ 25 I	Acute Δ 26 N	Right Δ 27 H	Obtuse Δ 28 I
Obtuse Δ 29 S	Obtuse Δ 30 E	Acute Δ 31 F	Obtuse Δ 32 I	Obtuse Δ 33 E	Obtuse Δ 34 L	Right Δ 35 D

8.

A Maze Mint

Each room in the maze contains a type of triangle, classified according to the measure of its angles. Enter into the room marked "ENTER". Follow the move clues below in the order given by moving to the room which names the type of triangle described in the clue.

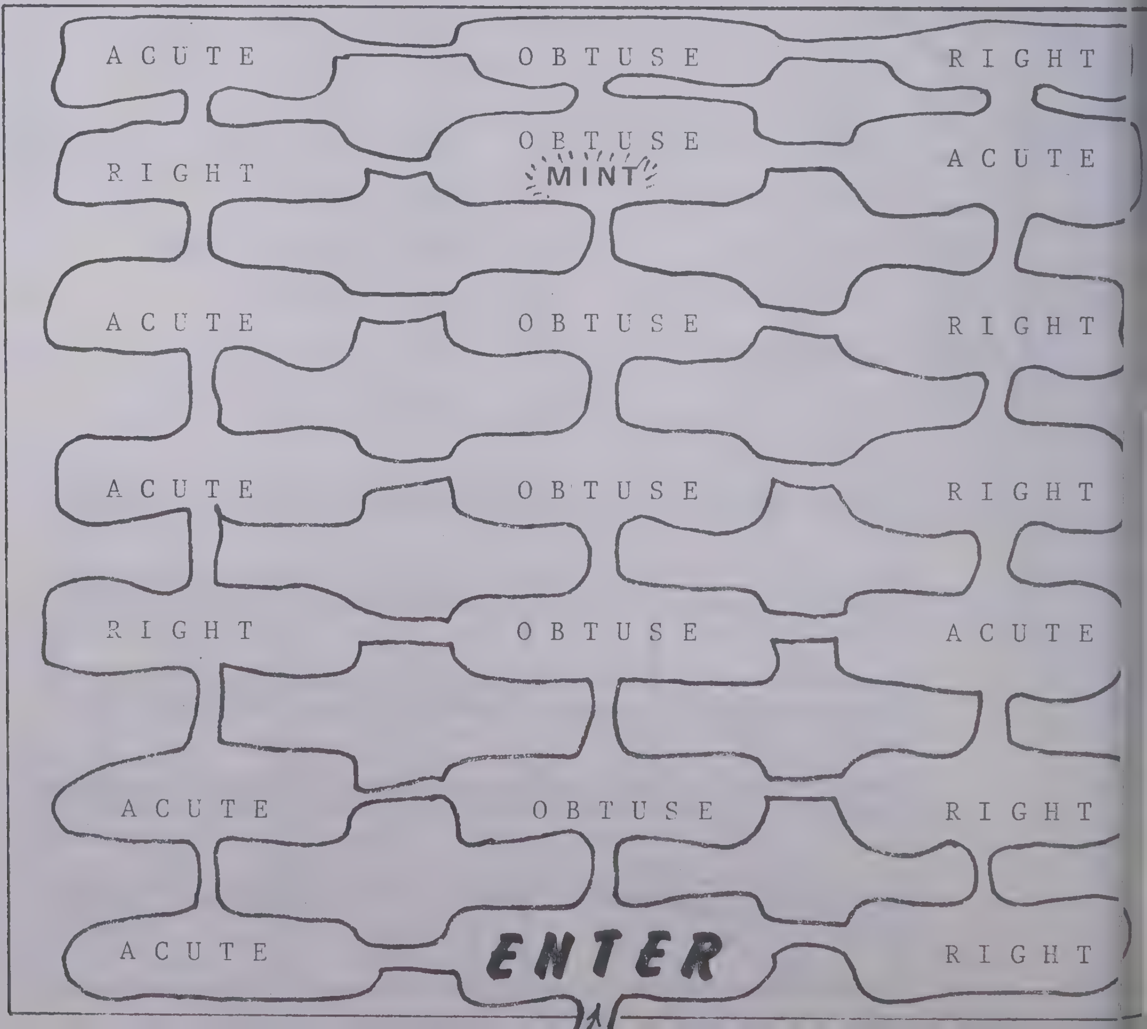
CLUES

1. 60°, 60°, 60°
2. 20°, 85°, 75°
3. 100°, 50°, 30°
4. 130°, 30°, 20°
5. 50°, 60°, 70°
6. 80°, 90°, 10°
7. 45°, 90°, 45°
8. 65°, 75°, 40°
9. 75°, 15°, 90°
10. 98°, 22°, 60°
11. 130°, 15°, 35°

A RIGHT TRIANGLE has ONE RIGHT ANGLE.

An ACUTE TRIANGLE has THREE ACUTE ANGLES.

An OBTUSE TRIANGLE has ONE OBTUSE ANGLE.



9. SPECIAL CHALLENGE:

Tell whether each of the following triangles shown in the diagram on the left is acute, right, or obtuse.

(a) ΔABE ________

(b) ΔBEC ________

(c) ΔCED ________

(d) ΔDEA ________

(e) ΔABD ________

(f) ΔBCD ________

(g) ΔADC ________

(h) ΔABC ________

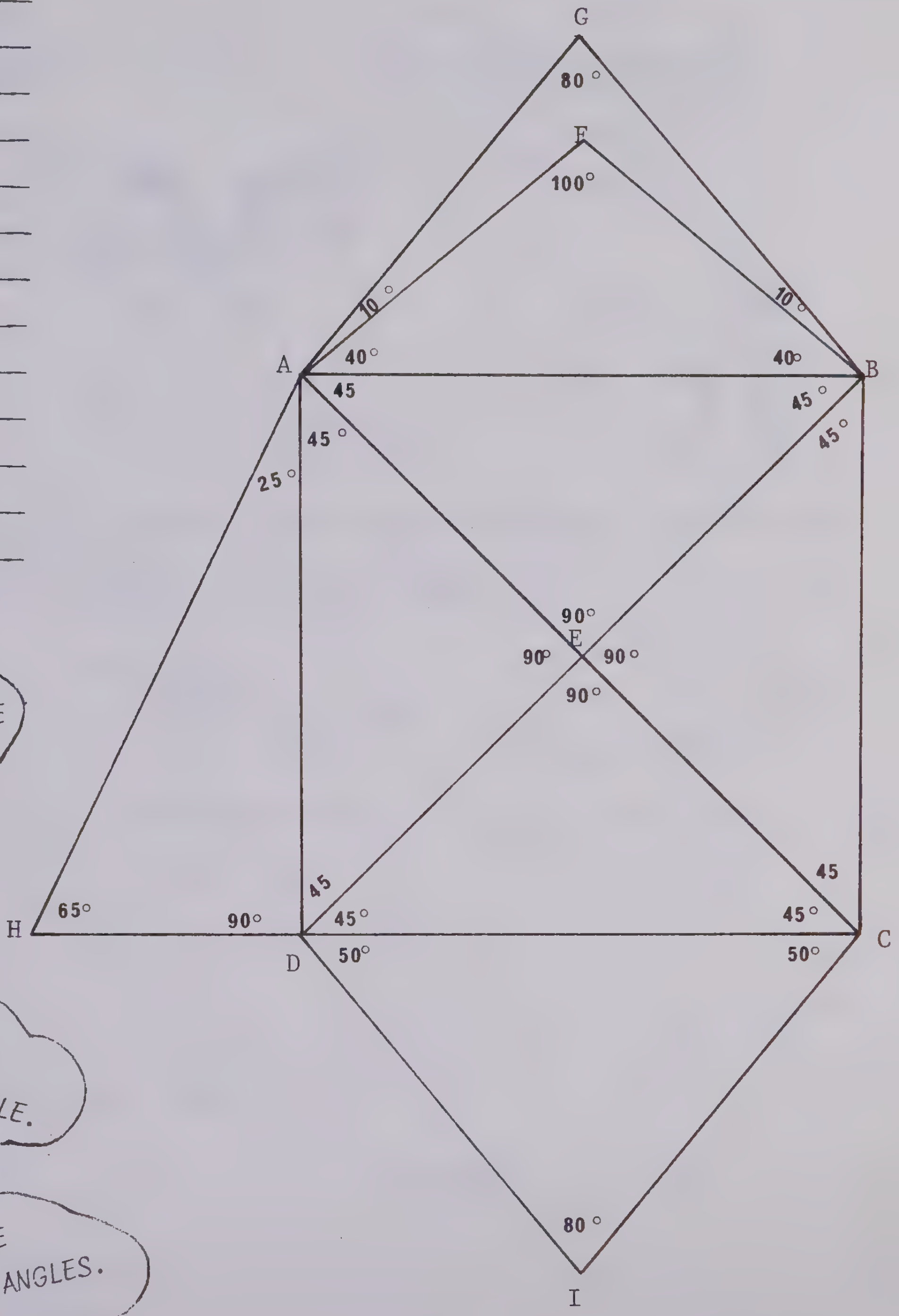
(i) ΔABG ________

(j) ΔAFB ________

(k) ΔDCI ________

(l) ΔADH ________

(m) ΔACH ________

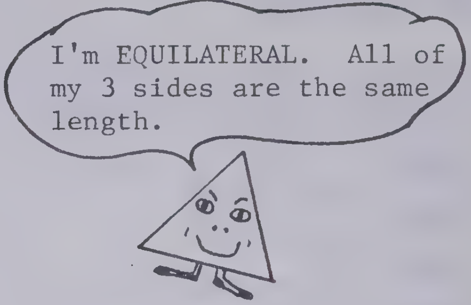


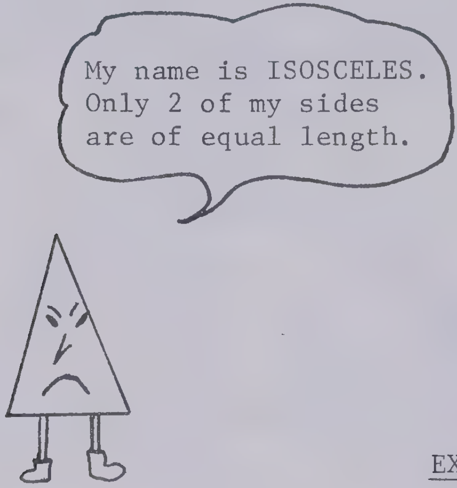
An OBTUSE TRIANGLE has ONE OBTUSE ANGLE

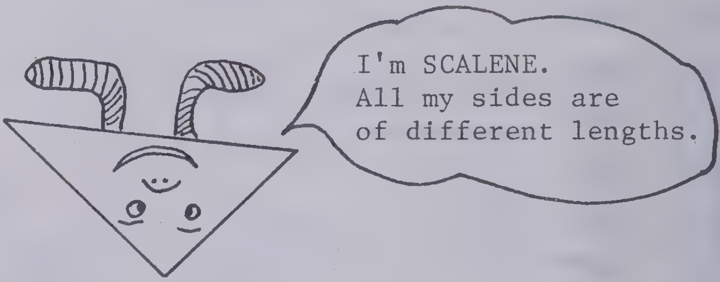
A RIGHT TRIANGLE has ONE RIGHT ANGLE.

An ACUTE TRIANGLE has THREE ACUTE ANGLES.

Triangles can also be named according to the lengths of their sides.


I'm EQUILATERAL. All of my 3 sides are the same length.

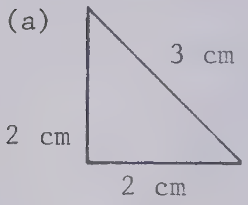

My name is ISOSCELES. Only 2 of my sides are of equal length.


I'm SCALENE. All my sides are of different lengths.

EXERCISES

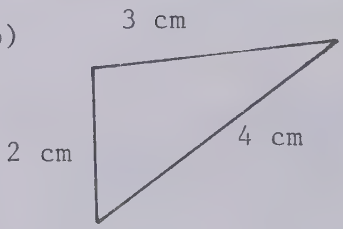
1. Classify each triangle according to the lengths of its sides as given.

(a)



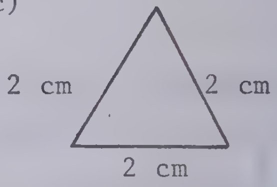
______

(b)



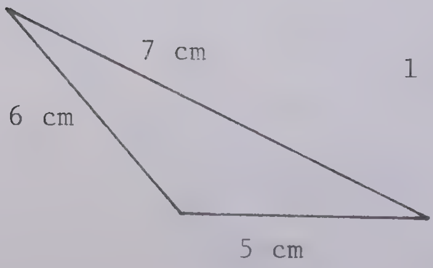
______

(c)



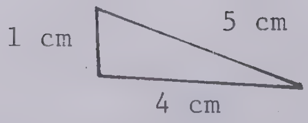
______

(d)



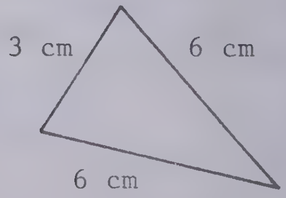
______

(e)



______

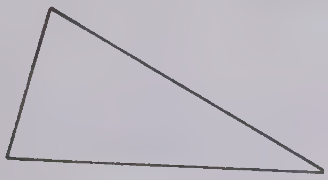
(f)



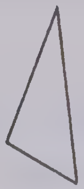
______

2. Measure the sides of the following triangles and classify them according to the lengths of their sides.

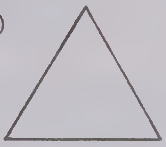
(a)



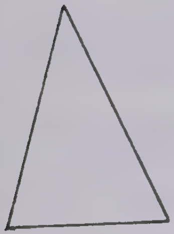
(b)



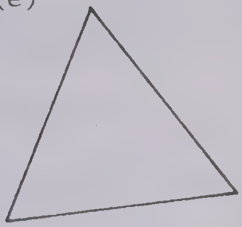
(c)



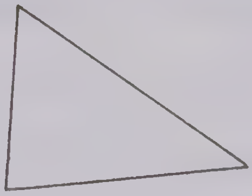
(d)



(e)

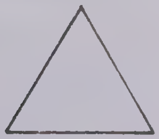


(e)

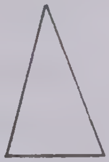


3. Look carefully at the following triangles and try to classify them according to their sides without actually measuring them.

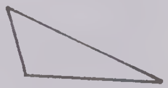
(a)



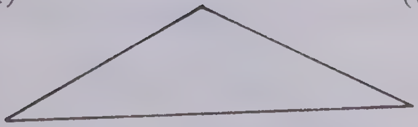
(b)



(c)

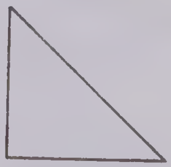


(d)

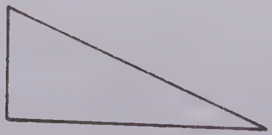


(e)

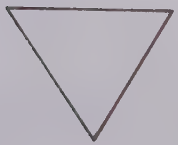
(f)



(g)



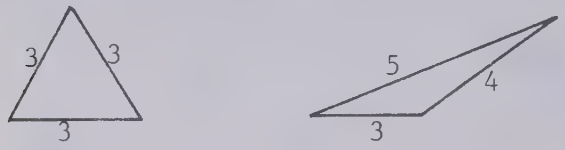
(h)

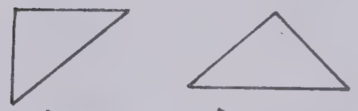


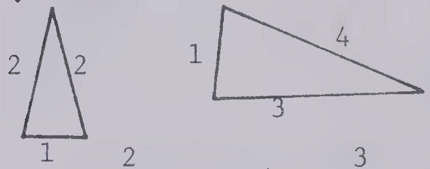
4. DAFFYNITION:

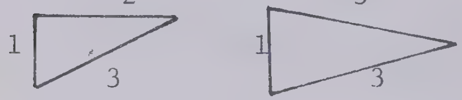
"A PERSON WHO ALWAYS TELEPHONES HIS FRIENDS
'COLLECT' BELIEVES IN __________."

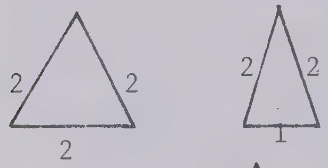
To complete the saying match the question number with the letter on the right that names the pair of triangles. Place that letter above the question number at the bottom of the page.

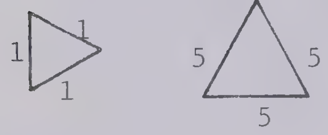
1.


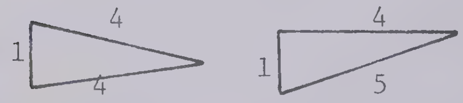
2.


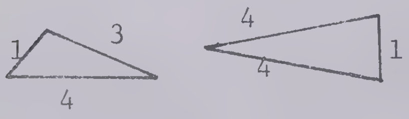
3.


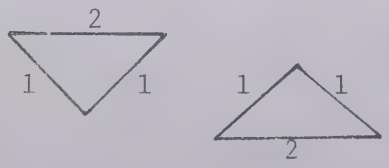
4.


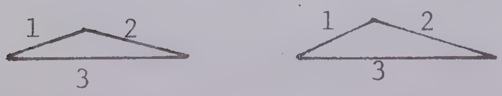
5.


6.


7.


8.


9.


10.


E - a scalene triangle and an isosceles triangle

F - a scalene triangle and an equilateral triangle

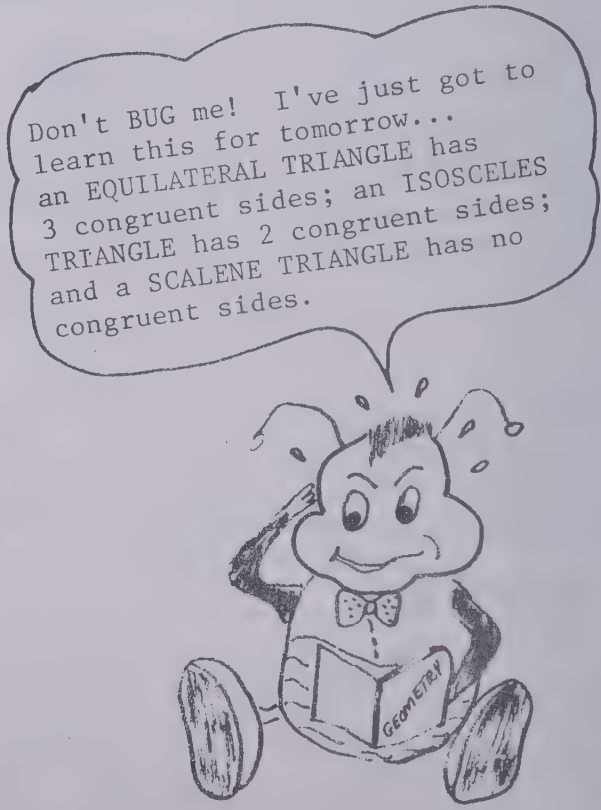
S - an isosceles triangle and an equilateral triangle

C - two isosceles triangles

H - two scalene triangles

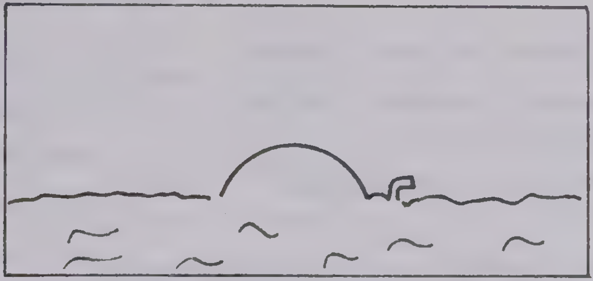
P - 2 equilateral triangles

R - we can't classify the triangles without measuring them


Don't BUG me! I've just got to learn this for tomorrow... an EQUILATERAL TRIANGLE has 3 congruent sides; an ISOSCELES TRIANGLE has 2 congruent sides; and a SCALENE TRIANGLE has no congruent sides.
GEOMETRY

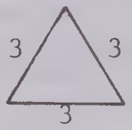
___ ___ ___ ___   ___ ___ ___ ___ ___ ___
1 2 3 4   5 6 7 8 9 10

Watzit



What is it? To name the picture find the word from the column at the right that correctly completes the sentence. Place the letter of the answer in the blank at the end of the question.

1. If all sides are congruent, the triangle is ________________.
2. If two sides of an equilateral triangle are 9 cm, the other side must be _____cm.
3. If the sides of a triangle are 1 cm, 12 cm, and 11 cm, it is a(an) ________ triangle.
4. All sides of an equilateral triangle are _________.
5. _________ side(s) of an isosceles triangle has/have a different length.
6. If two sides are congruent a triangle is_______.
7. All sides of a scalene triangle are ___________.
8. If one of the congruent sides of an isosceles triangle is 2 cm, then the other congruent side must be ______ cm.
9. The triangle to the right is a(an) ___________________ triangle.



10. Two sides of an isosceles triangle are ________.
11. If one side of a scalene triangle is 1 cm and one side is 11 cm, the third side cannot be ______ cm.
12. ________ sides of a scalene triangle are equal.
13. A triangle with all sides of different lengths is ___________.
14. Can three sides of an equilateral triangle be 4 cm, 5 cm, and 6 cm? ___________
15. Can three sides of an equilateral triangle be 4 cm, 4 cm, and 4 cm? ___________
16. The sides of a (an) __________________triangle might be 4 cm, 5 cm, and 7 cm.
17. If an isosceles triangle has sides of 5 cm and 12 cm, the third side could be _________cm.

E - four

A - congruent

N - different

S - no

O - scalene

I - isosceles

F - equilateral

M - yes

K - five

T - one

L - nine

G - two

P - three

5.

18. __________ triangles have two equal sides

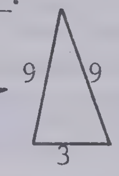
19. No side of an equilateral triangle can be _____________ from the others.

20. _________ sides of an isosceles triangle can be equal.

21. No sides of a scalene triangle are _________.

22. All triangles have ___________ sides.

23. This triangle is ______________.

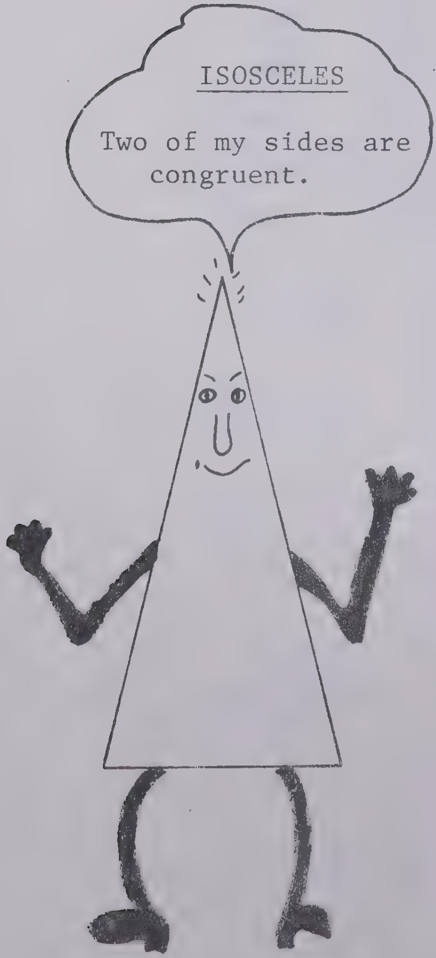


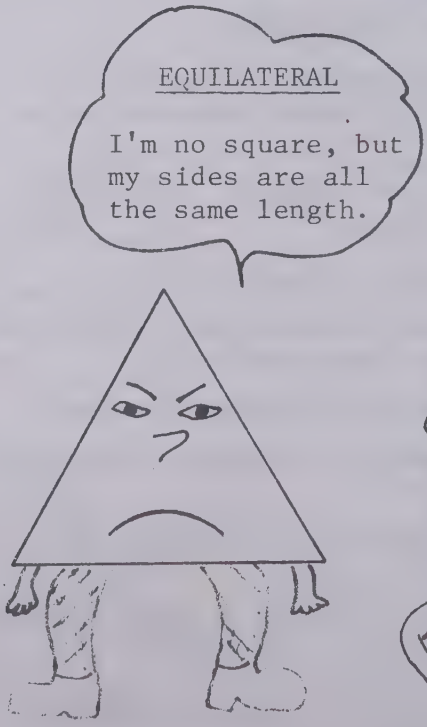
24. ___________ sides of a scalene triangle are different in measure.

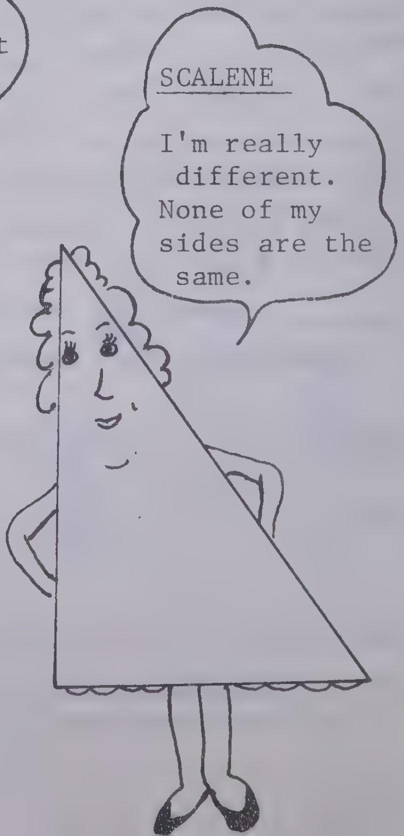
25. If an equilateral triangle has one side of 4 cm, the other two sides must be _______ cm.

___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___ 13

___ 14 ___ 15 ___ 16 ___ 17 ___ 18 ___ 19 ___ 20 ___ 21 ___ 22 ___ 23 ___ 24 ___ 25

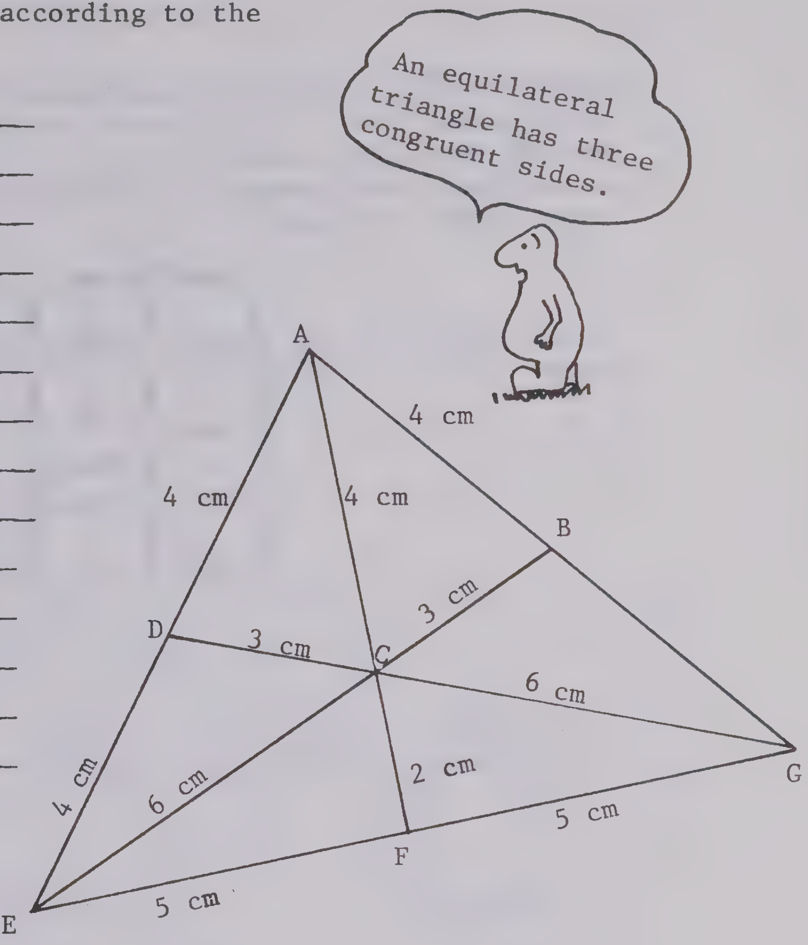

ISOSCELES
Two of my sides are congruent.


EQUILATERAL
I'm no square, but my sides are all the same length.

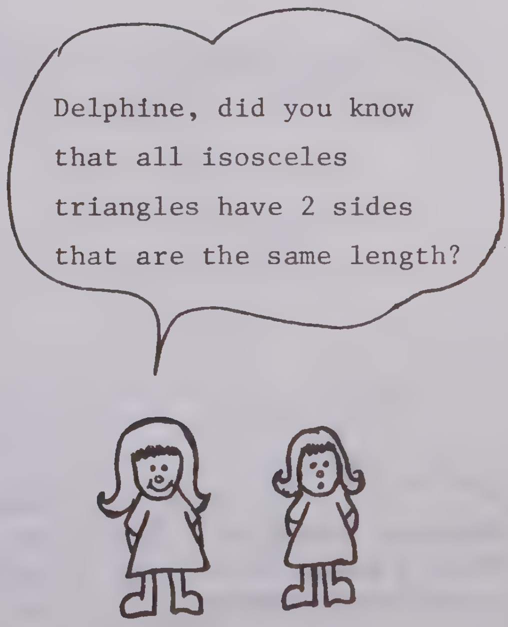

SCALENE
I'm really different. None of my sides are the same.

6. Classify each of the triangles according to the length of their sides.

(a) Triangle AEG ____________
(b) Triangle AEF ____________
(c) Triangle AEB ____________
(d) Triangle EBG ____________
(e) Triangle AFG ____________
(f) Triangle ADC ____________
(g) Triangle ABC ____________
(h) Triangle AEC ____________
(i) Triangle ACG ____________
(j) Triangle ACE ____________
(k) Triangle ADG ____________
(l) Triangle ECF ____________
(m) Triangle GCF ____________
(n) Triangle ECG ____________

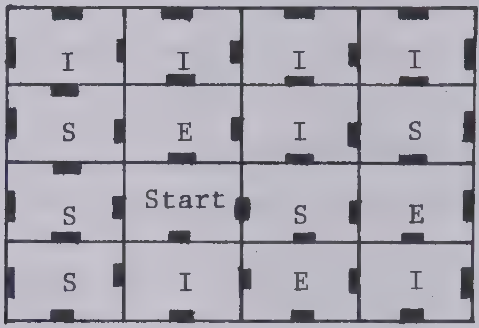


Scalene triangles have no equal sides


Delphine, did you know that all isosceles triangles have 2 sides that are the same length?

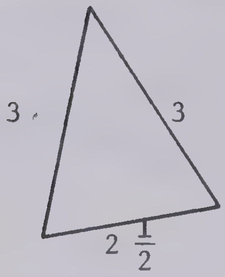
7.

Suppose that you are in the middle of a 16 room house. Each room has only ONE unlocked door. To find your way out of the house, move from room to room by using the clues (a) to (f). (I stands for isosceles, S stands for scalene, and E stands for equilateral). Trace the path you must take to get out of the house.

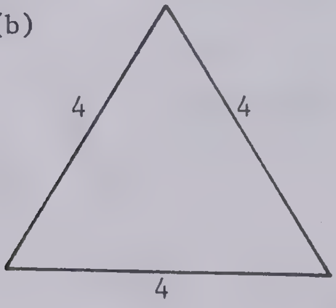


I	I	I	I
S	E	I	S
S	Start	S	E
S	I	E	I

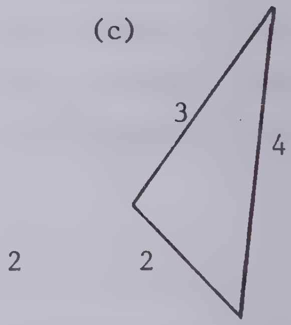
(a)



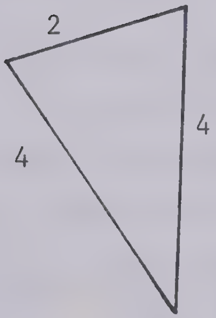
(b)



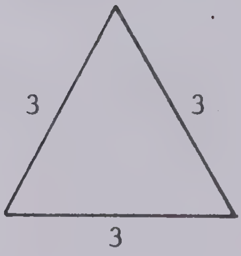
(c)



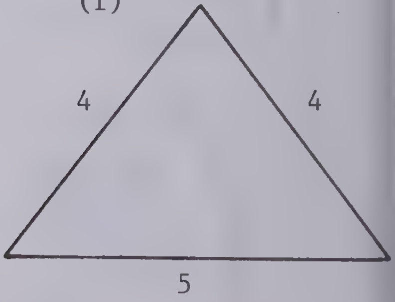
(d)



(e)



(f)

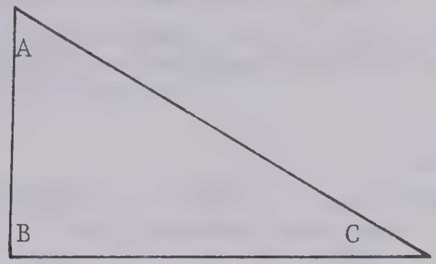


Scalene triangles have 3 sides all of a different measure

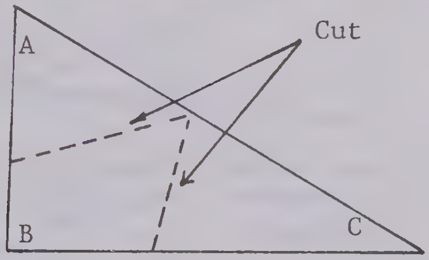
Equilateral triangles have 3 sides all of the same measure.

Isosceles triangles have 2 sides of the same measure and one of a different measur

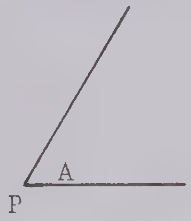
1. Draw a triangle ABC on a piece of cardboard or any other kind of hard paper.



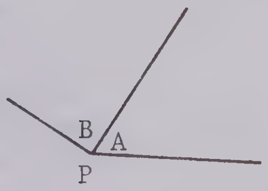
Mark each angle inside the triangle so that you do not lose your angles after you cut them out. Then carefully cut each angle out of the triangle similarly to the way shown below.



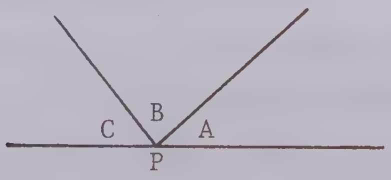
Mark a point P on a clean sheet of paper. Place angle A on the paper so that vertex A is on point P. Trace the two sides of angle A onto the paper, as shown below.



Then place angle B on the paper so that vertex B is on point P (or vertex A) and one side of angle B being on one (any) side of angle A. Trace angle B carefully onto the paper, as shown below.

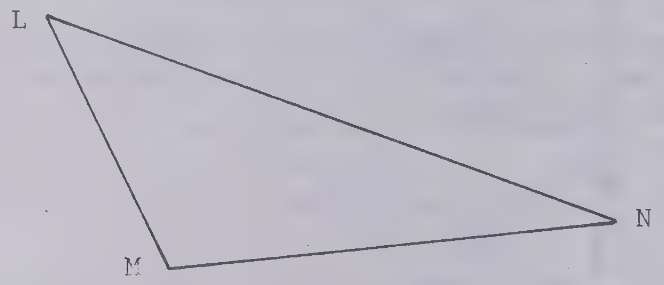


Then place angle C on the paper so that vertex C is on point P and one side of angle C being on the side of angle B which is not on angle A. Trace the angle carefully, as shown below.



B. What do the three angles form? They form a straight line. A straight line has 180°. Therefore, the sum of three angles of a triangle is 180°. Test this conclusion by drawing other triangles and following the same procedure as above.

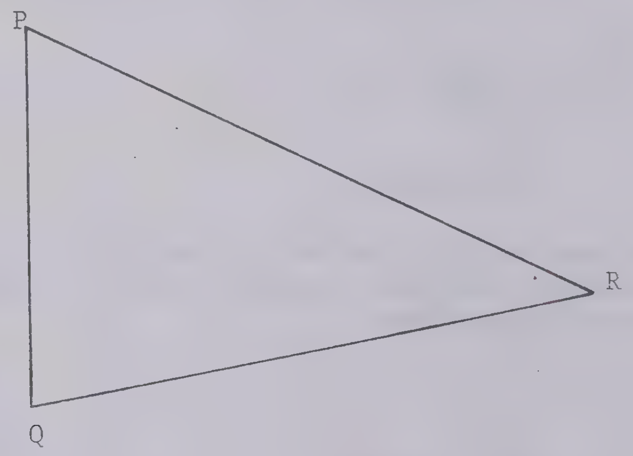
You may arrive at the same conclusion as above by measuring the angles of a triangle with a protractor. Draw any triangle LMN.



Measure carefully angle L with a protractor. Angle L = ________.
Measure carefully angle M with a protractor. Angle M = ________.
Measure carefully angle N with a protractor. Angle N = ________.

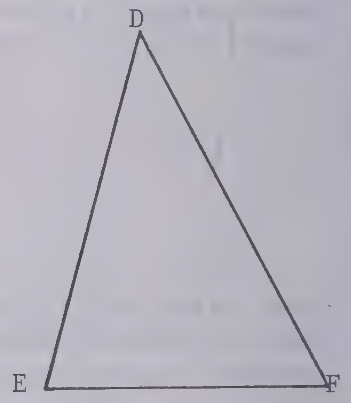
The sum of all 3 angles = ________.

Therefore, the sum of three angles of a triangle is 180°.
Try the above procedure using other triangles.



∠P = ______
∠Q = ______
∠R = ______

Total = 180°



∠D = 43°
∠E = ______
∠F = ______

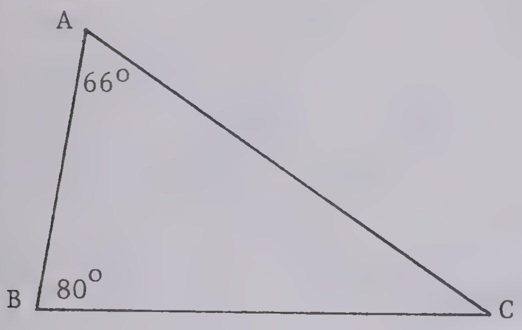
Total = ______

REMEMBER - The sum of three angles of any triangle is 180°.

Finding the third angle of a triangle:

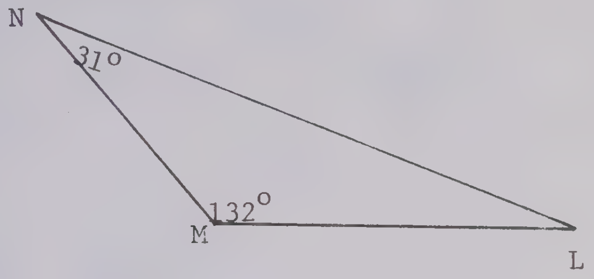
If we know the measures of our two angles of a triangle we can always find the measure of the third angle.

Example 1



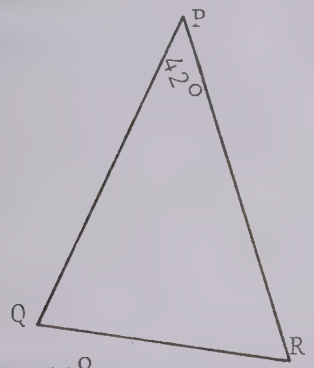
$\angle A = 66^\circ$
$\angle B = 80^\circ$
$\angle A + \angle B = 66^\circ + 80^\circ = 146^\circ$
$\angle C = 180^\circ - 146^\circ = 34^\circ$
Check: $66^\circ + 80^\circ + 34^\circ = 180^\circ$

Example 2



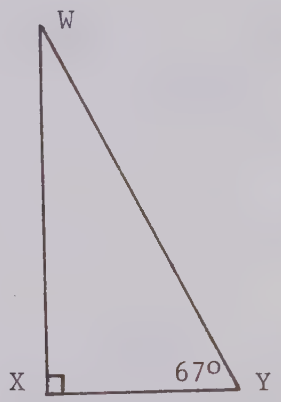
$\angle M = 132^\circ$
$\angle N = 31^\circ$
$\angle M + \angle N = 163^\circ$
$\angle L = 180^\circ - 163^\circ = 17^\circ$
Check: $132^\circ + 31^\circ + 17^\circ = 180^\circ$

Example 3 (Special Challenge)



$\angle P = 42^\circ$
$\angle Q + \angle R = 180^\circ - 42^\circ = 138^\circ$
But $\angle Q = \angle R$ (isosceles triangle)
$\angle Q = 138^\circ$ divided by $2 = 69^\circ$
$\angle R = 69^\circ$

Example 4

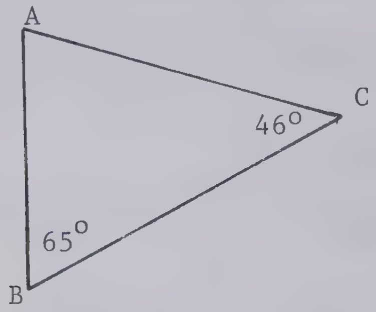


$\angle Y = 67^\circ$
$\angle X = 90^\circ$ (right angle)
$\angle X + \angle Y = 67^\circ + 90^\circ = 157^\circ$
$\angle W = 180^\circ - 157^\circ = 23^\circ$
Check: $67^\circ + 90^\circ + 23^\circ = 180^\circ$

EXERCISES UNIT III OBJECTIVE NO. 14

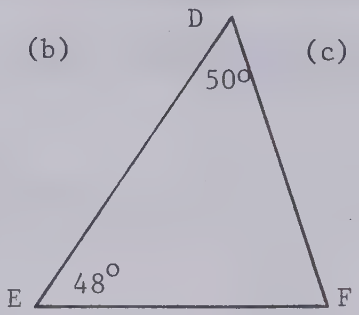
1. Do the following exercise: find the measure of the missing angles.

(a)



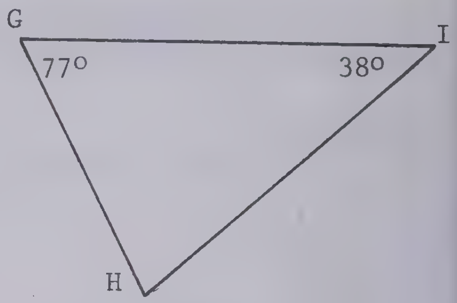
∠A = ______

(b)



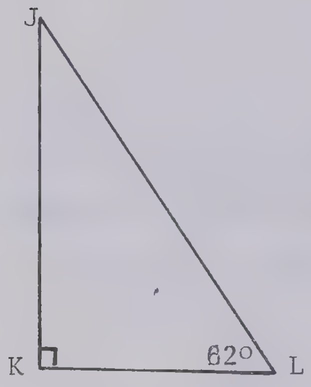
∠F = ______

(c)



∠H = ______

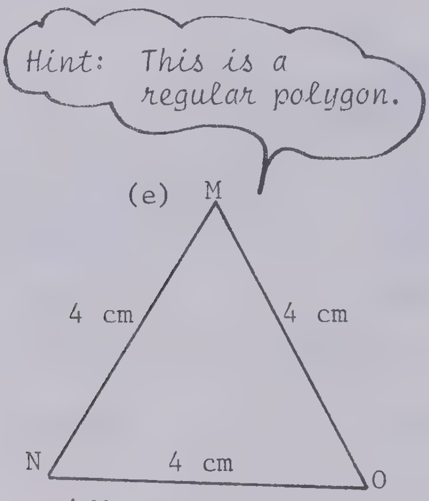
(d)



∠K = ______

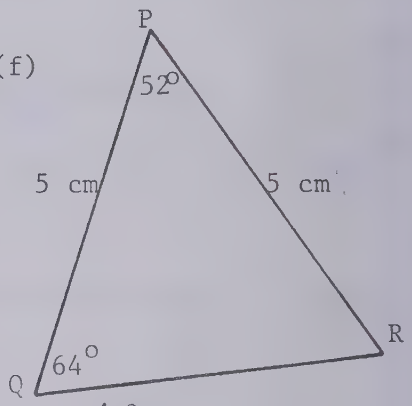
∠J = ______

(e)



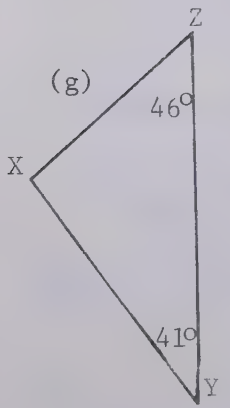
∠M = ______
∠N = ______
∠O = ______

(f)



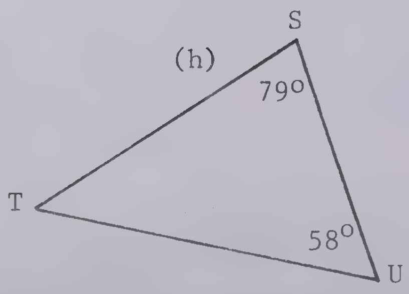
∠Q = ______
∠R = ______

(g)



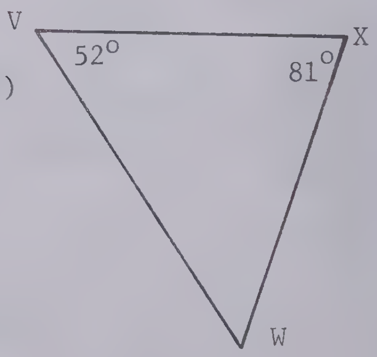
∠X = ______

(h)



∠T = ______

(i)

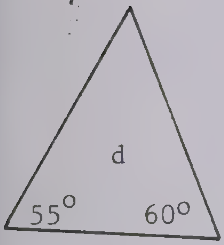


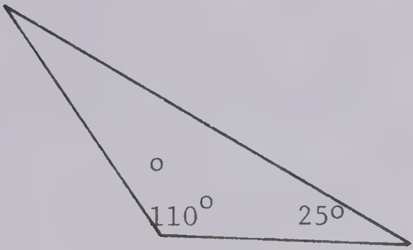
∠W = ______

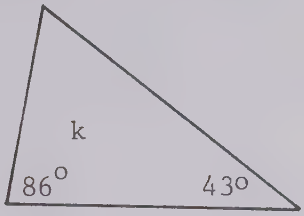
"WHAT DID THE NEWLY MARRIED RADIO ANNOUNCER BECOME?"

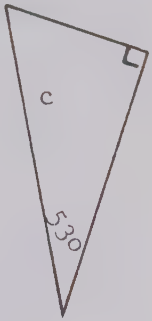
To find the answer to the above question, find the missing angles below. In each triangle you will find a letter. Write the letter above the correct answer at the bottom of the page.

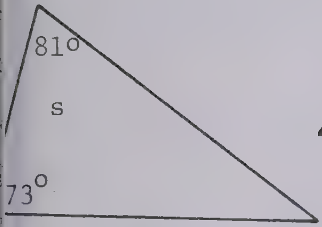
Sum of the angles of a triangle
are equal to 180°

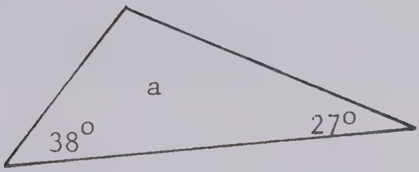


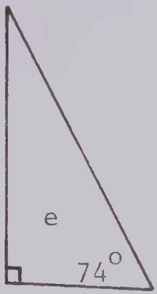


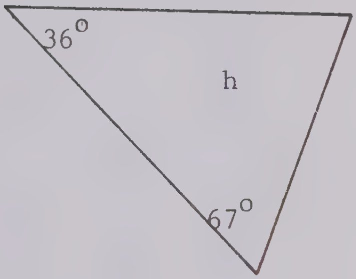


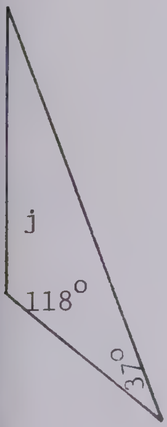


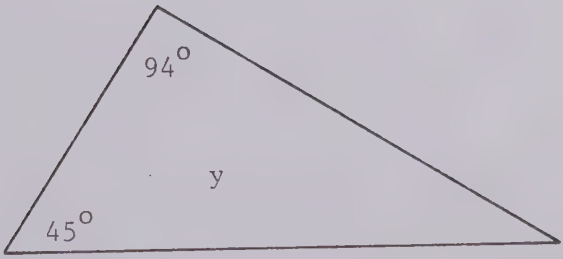


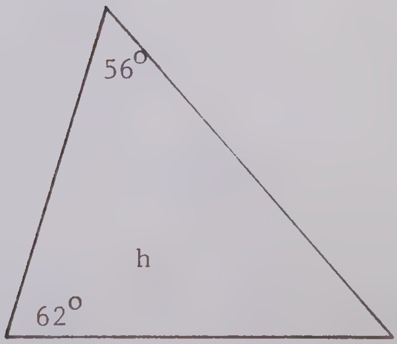












___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
15 65 26 77 62 25 45 37 51 16 41

3. "WHAT IS A WOUNDED FLOWER"

To answer this question find the measure of the missing angles. After each question you will find a letter. Arrange the letters so that the letter of the smallest answer comes first, second smallest next, third smallest after that, and so on.

(a) 120°, 34°, _____$^\circ$ A

(b) 87°, 38° , _____$^\circ$ E

(c) 131°, 16°, _____ C

(d) 23°, 98°, _____ D

(e) 60°, 70°, _____ Y

(f) 29°, 38°, _____ A

(g) 51°, 102° _____ L

(h) 60°, 60°, _____ S

(i) 60°, 47°, _____ S

(j) 90°, 28°, _____ U

(k) 81°, 89°, _____ A

(l) 77°, 64°, _____ K

(m) 105°, 58°, _____ A

(n) 13°, 19°, _____ N

(o) 59°, 74°, _____ E

ANSWER:

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

___ ___ ___ ___

Supplementary Angles

Examples: The supplement of 60° is 120° since $60^\circ + 120^\circ = 180^\circ$

The supplement of 80° is 100°, since $80^\circ + 100^\circ = 180^\circ$

ANY TWO angles whose measures add up to 180° are called SUPPLEMENTARY ANGLES.

Who holds the record for most goals in a single season in the N.H.L.?

To find the answer to this question follow these directions:

Find the supplement of each of the following angles. Then find the answer in the code. Each time it appears in the code, write the letter of that problem below it. The first one is done for you.

E 40° - $40^\circ + \square = 180^\circ$, $\square = 140^\circ$

P 160° - $160^\circ + \square = 180^\circ$, $\square = ?$

S 90°

H 120°

T 168°

S 23°

I 137°

I 69°

P 103°

O 88°

O 41°

L 179°

20°	60°	111°	1°	140°	157°	77°	92°	90°	43°	12°	139°
____	____	____	____	E	____	____	____	____	____	____	____

Complementary Angles

Examples: The complement of 30° is 60° since $30^\circ + 60^\circ = 90^\circ$.

The complement of 70° is 20°, since $70^\circ + 20^\circ = 90^\circ$.

> ANY TWO angles whose measures add up to 90° are called COMPLIMENTARY ANGLES.

2. Who was named Canadian male athlete of the year in 1975?

To find the answer to this question follow these directions:

Find the complement of each of the following angles. Then find the answer in the code. Each time it appears in the code, write the letter of that problem below it. The first one is done for you.

L 10° - $10^\circ + \square = 90^\circ$ $\square = 80^\circ$

E 40° - $40^\circ + \square = 90^\circ$, $\square = ?$

B 75°

C 35°

B 84°

R 17°

B 79°

A 7°

O 28°

K 53°

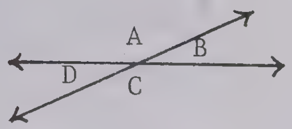
Y 61°

15°	62°	6°	11°	29°	55°	80°	83°	73°	37°	50°
____	____	____	____	____	____	L	____	____	____	____

Opposite Angles

OPPOSITE ANGLES are formed by two intersecting lines.
LOOK at the example.

Example:



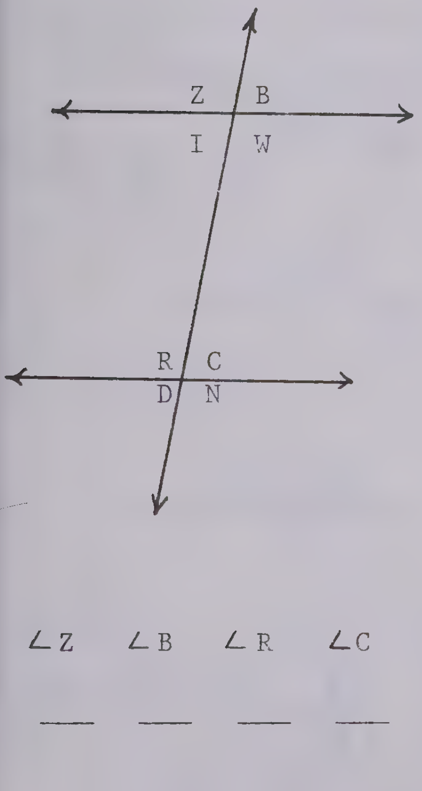
∠A and ∠C are opposite angles.

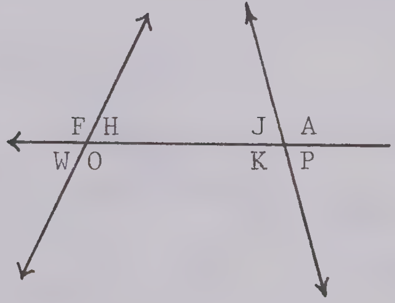
∠B and ∠D are opposite angles.

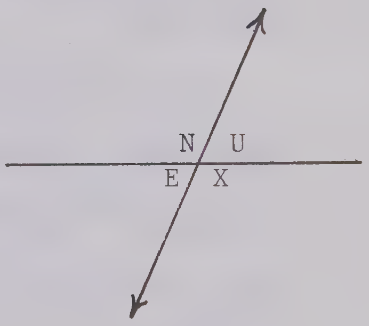
Opposite angles are always congruent.

What kind of pain does not hurt?

To this question find the opposite angle of each of the given angles. Then write the letter of that angle below it







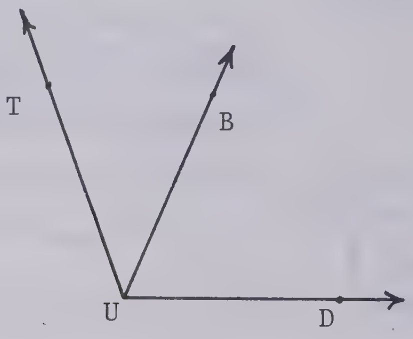
∠Z ∠B ∠R ∠C ∠F ∠H ∠J ∠K ∠X ∠U

___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Adjacent Angles

Two angles that have a common vertex and share a common side are called ADJACENT ANGLES.

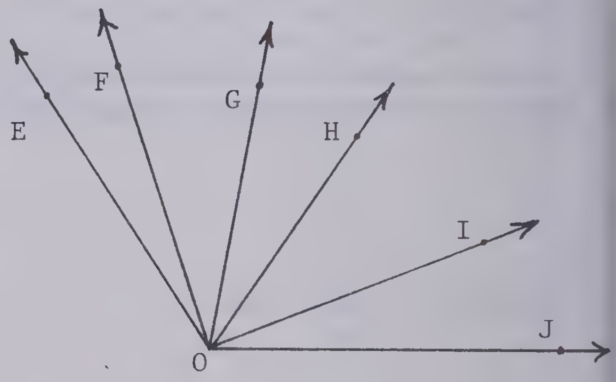
Example:



∠TUB and ∠BUD are ADJACENT ANGLES.

Note that they share the vertex U and the side UB.

4. What angles are adjacent to the following?



(a) ∠EOF ∠ FOG

(b) ∠GOH ∠ FOG and ________

(c) ∠FOG ________ and ________

(d) ∠IOJ ________

(e) ∠HOI ________ and ________

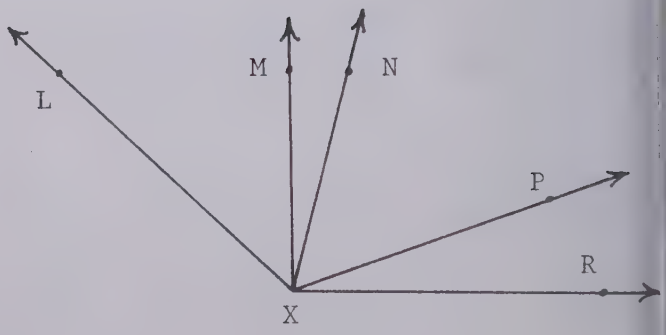
What angles are adjacent to the following?

(f) ∠MXN ________ and ________

(g) ∠PXR ________

(h) ∠LXM ________

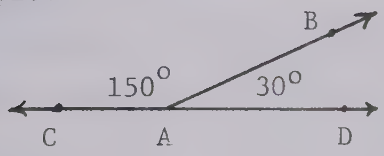
(i) ∠NXP ________ and ________



Linear Angles

Two adjacent angles whose measures add up to 180° are called LINEAR ANGLES.

Example:



∠CAB and ∠BAD are adjacent angles.

Their measures are 150° + 30° = 180°.

Therefore, they are also linear angles.

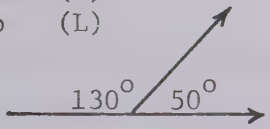
NOTE: *That two linear angles will always form a straight line (180°).*

"WHAT DID THE BIG TOMATO SAY TO THE LITTLE TOMATO?"

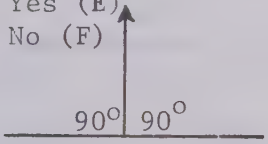
Are each pair of angles below linear?

Circle the correct answer for each question and place the matching letter in the blanks below.

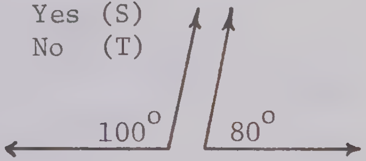
(a) Yes (K)
No (L)



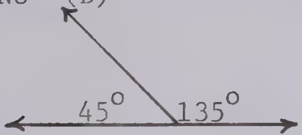
(b) Yes (E)
No (F)

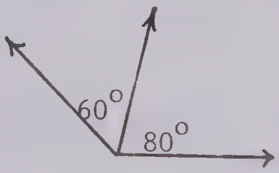


(c) Yes (S)
No (T)



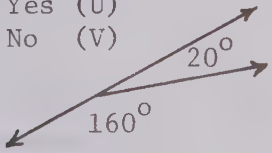
(d) Yes (C)
No (D)



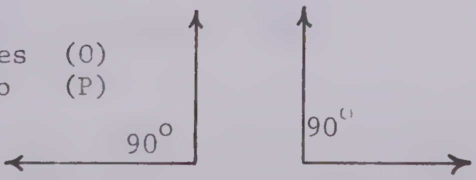


(e) Yes (G)
No (H)

(f) Yes (U)
No (V)



(g) Yes (O)
No (P)

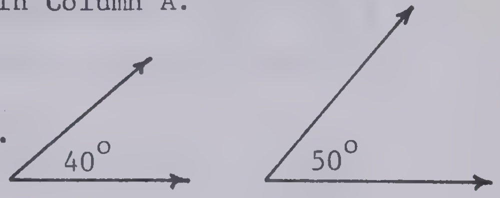


___ ___ ___ ___ ___ ___ ___
1 2 3 4 5 6 7

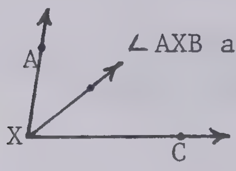
6. Write the correct letter from Column B in the blanks to the left of the numbers in Column A.

Column A

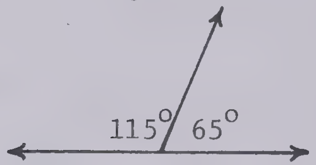
_____ 1.



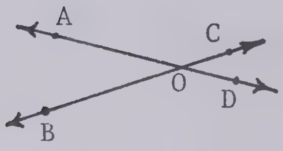
_____ 2. ∠AXB and ∠BXC are



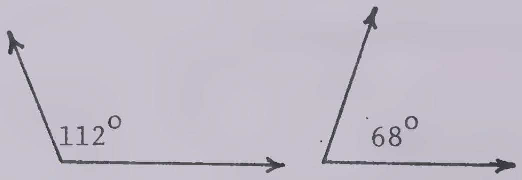
_____ 3.



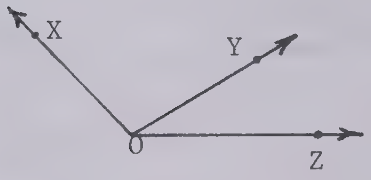
_____ 4. ∠AOC and ∠BOD are



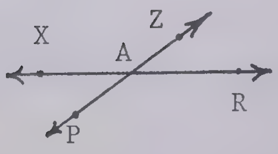
_____ 5.



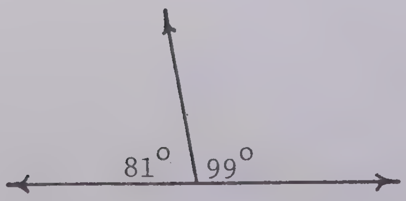
_____ 6. ∠XOY and ∠YOZ are



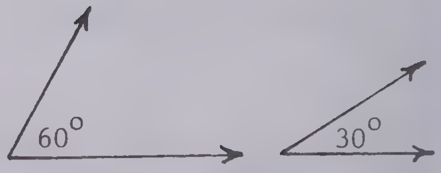
_____ 7. ∠XAZ and ∠PAR are



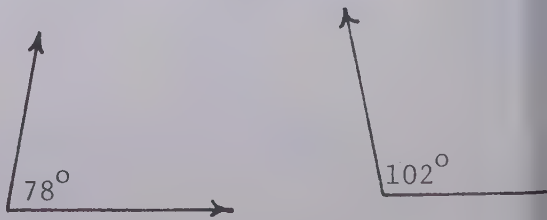
_____ 8.



_____ 9.



_____ 10.



Column B

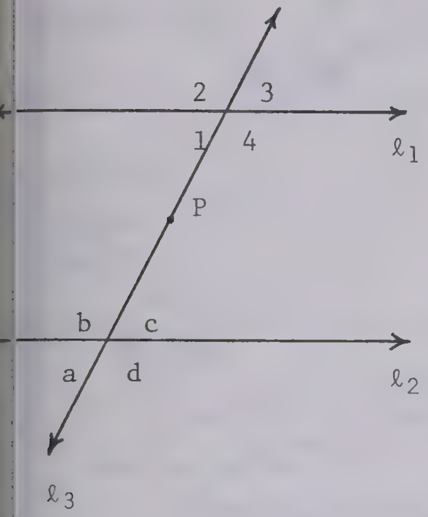
a. supplementary angles

b. adjacent angles

c. linear angles

d. complementary angles

e. vertical angles



ℓ_1 is parallel to ℓ_2

ℓ_3 is a transversal

The corresponding angles are	
∠1	∠a
∠2	∠b
∠3	∠c
∠4	∠d

The alternate angles are	
∠1	∠c
∠4	∠b
∠2	∠d
∠3	∠a

Identify the corresponding angles and the alternate angles for the diagram at the right. Use the tables below.

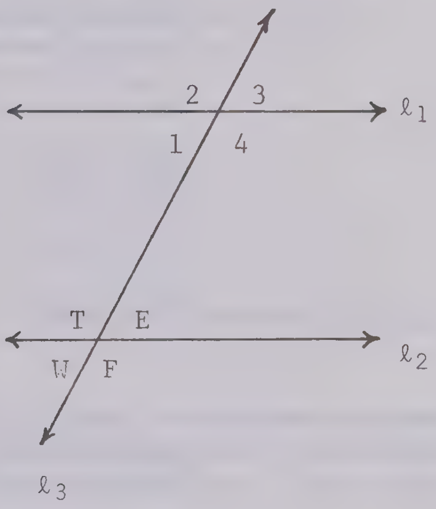
(a)

∠4 and ∠F are corresponding angles

∠3 and ___ are corresponding angles

∠1 and ___ are corresponding angles

∠2 and ___ are corresponding angles

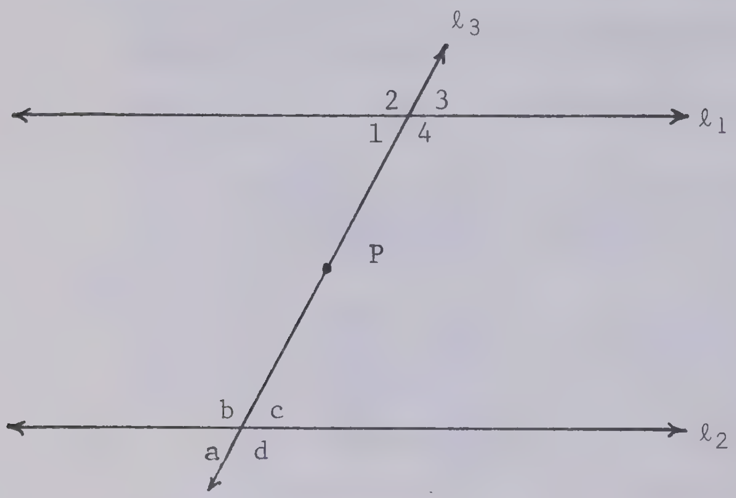


(b) ∠1 and E are alternate angles

∠4 and ___ are alternate angles

∠2 and ___ are alternate angles

∠3 and ___ are alternate angles



ℓ_1 is parallel to ℓ_2

ℓ_3 is a transversal

2. Complete the table below. You are to trace the first given angle and SLIDE it to the second given angle to determine if they are congruent.

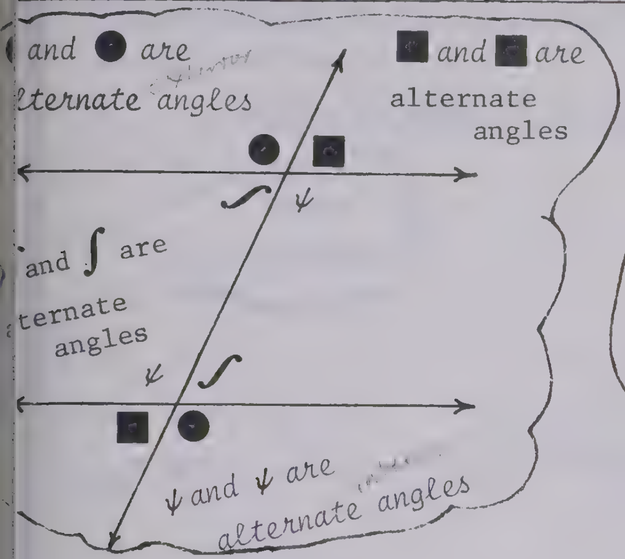
Trace	Slide to	Congruent?
∠1	∠a	Yes
∠2	∠b	
∠3	∠c	
∠4	∠d	

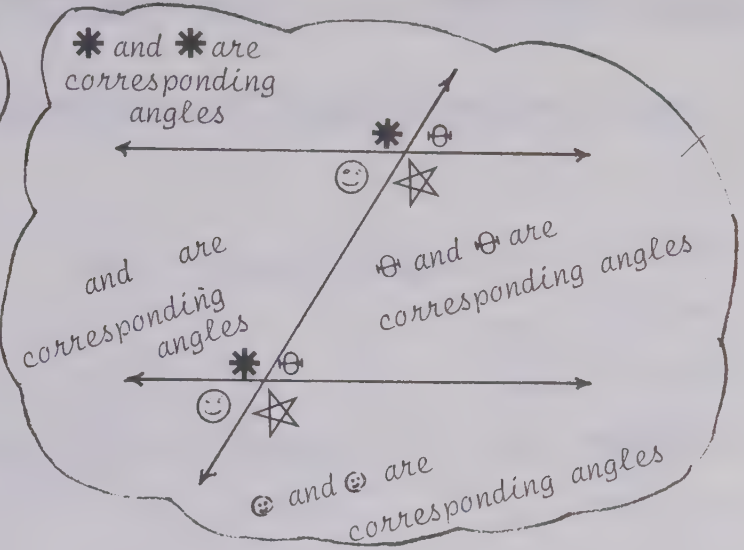
Are the corresponding angles always congruent? ______

3. Complete the table below. Trace the first given angle and TURN it a one-half turn to the second given angle to determine if they are congruent. (Use point P as the turn center.)

Trace	Rotate $\frac{1}{2}$ turn around P to	Congruent?
∠1	∠c	Yes
∠4	∠b	
∠2	∠d	
∠3	∠a	

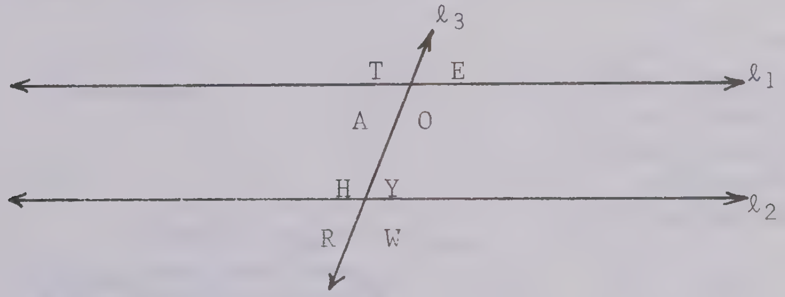
Are the alternate angles always congruent?





"WHY CAN'T BIKES STAND UP BY THEMSELVES?"

To find the answer to this important question, fill in the following blanks from 1 - 15, with the appropriate letter using the diagram below. Then using the letter from each question decode the answer by placing the letter in the corresponding block at the bottom of the page.



1. H and ___ are corresponding angles.
2. O and ___ are alternate angles.
3. Y and ___ are corresponding angles.
4. A and ___ are alternate angles.
5. Y and ___ are alternate angles.
6. E and ___ are alternate angles.
7. Y and ___ are corresponding angles.
8. W and ___ are alternate angles.
9. O and ___ are corresponding angles.
10. H and ___ are alternate angles.
11. H and ___ are corresponding angles.
12. ℓ_1 and ℓ_2 are parallel lines if the corresponding angles are equal.
13. A and ___ are corresponding angles.
14. R and ___ are alternate angles.
15. ℓ_1 and ℓ_2 are parallel lines if the alternate angles are equal.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

5. Using the following diagram find the measures of the missing angles.

(a) ∠ A = _____

(b) ∠ B = _____

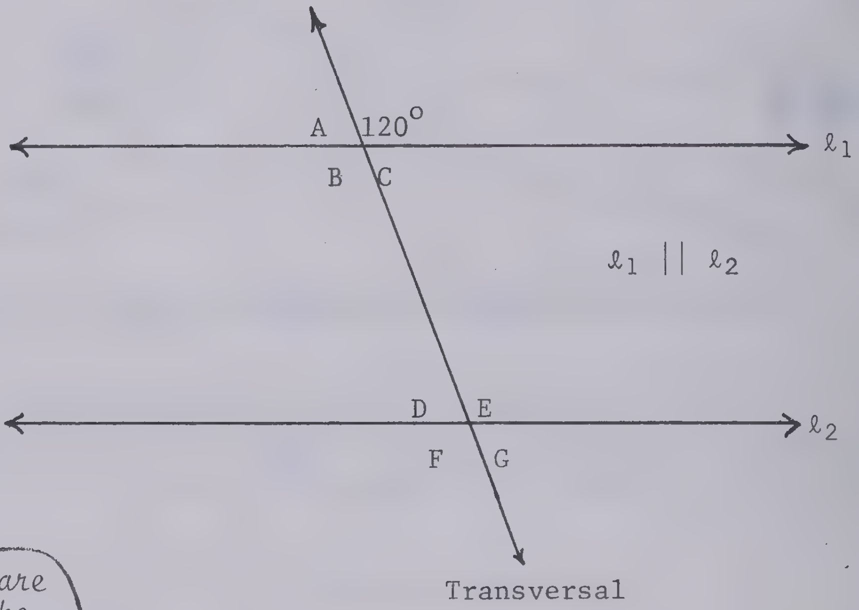
(c) ∠ C = _____

(d) ∠ D = _____

(e) ∠ E = _____

(f) ∠ F = _____

(g) ∠ G = _____



|| means 'parallel to'.

If two lines are parallel then the corresponding angles are equal and the alternate angles are equal.

There are 180° in a straight line.

Transversal is a line that intersects two or more other lines.

Opposite angles are congruent.

6. Special Challenge:

Find the missing angles using the principle of corresponding and alternate angles.

(a) $\angle 1$ = ____

(b) $\angle 2$ = ____

(c) $\angle 3$ = ____

(d) $\angle 4$ = ____

(e) $\angle 5$ = ____

(f) $\angle 6$ = ____

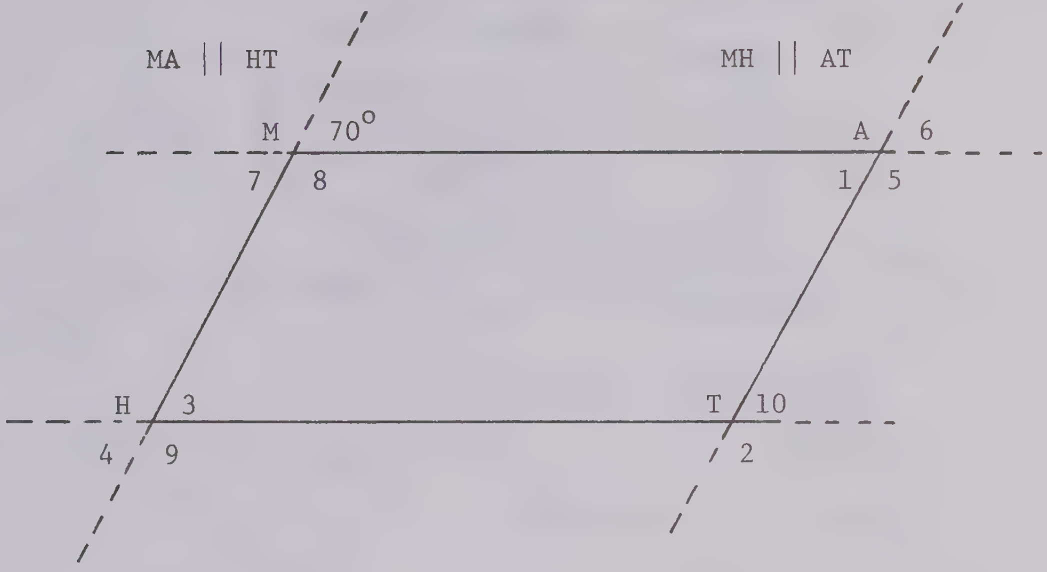
(g) $\angle 7$ = ____

(h) $\angle 8$ = ____

(i) $\angle 9$ = ____

(j) $\angle 10$ = ____

MATH is a parallelogram.



MA || HT

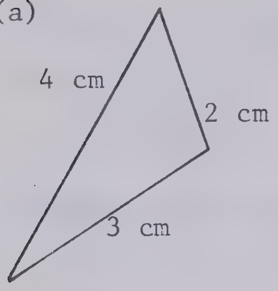
MH || AT

|| means 'parallel to'.

Perimeter means the distance AROUND a polygon.

1. Find the perimeter of each of the following polygons.

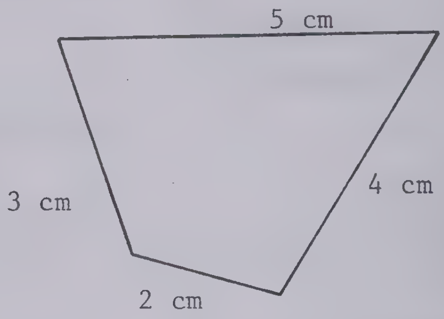
(a)



Perimter = 4 cm + 2 cm + 3 cm
= 9 cm

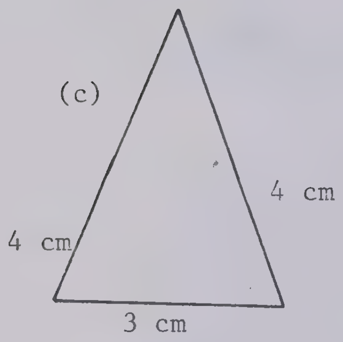
NOTICE ! ...
To find perimeter you add the lengths of all the sides.

(b)



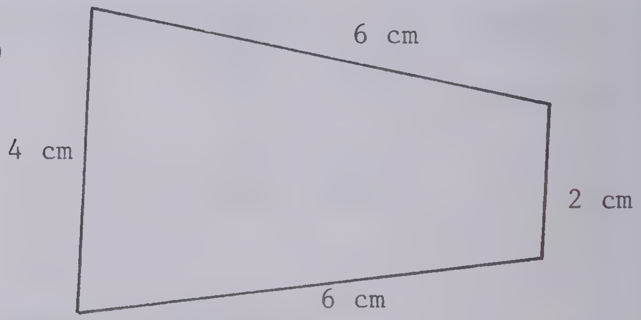
Perimeter = 5 cm + 3 cm + 2 cm + 4 cm
= 14 cm

(c)



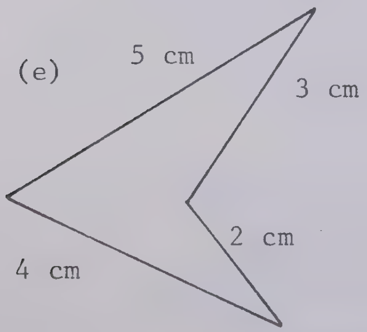
Perimeter = ____________

(d)



Perimeter = ______________

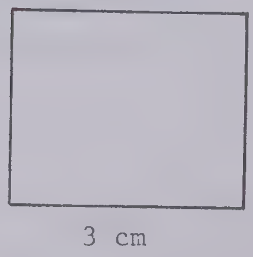
(e)



Perimeter = ____________

(f)

This polygon is a square.



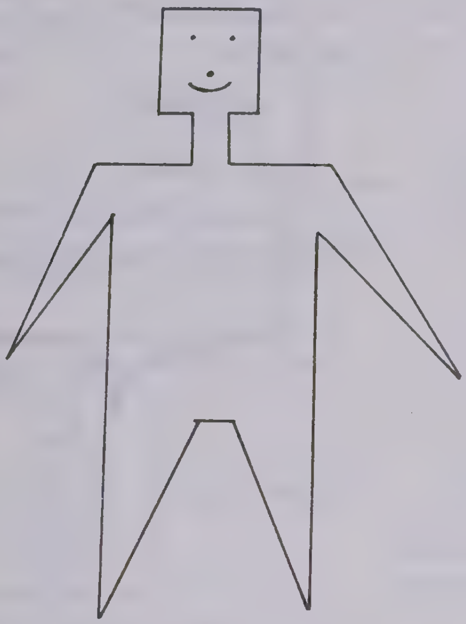
Perimeter = ______________

2. Write a statement that would tell how YOU would find the PERIMETER of any polygon.

____

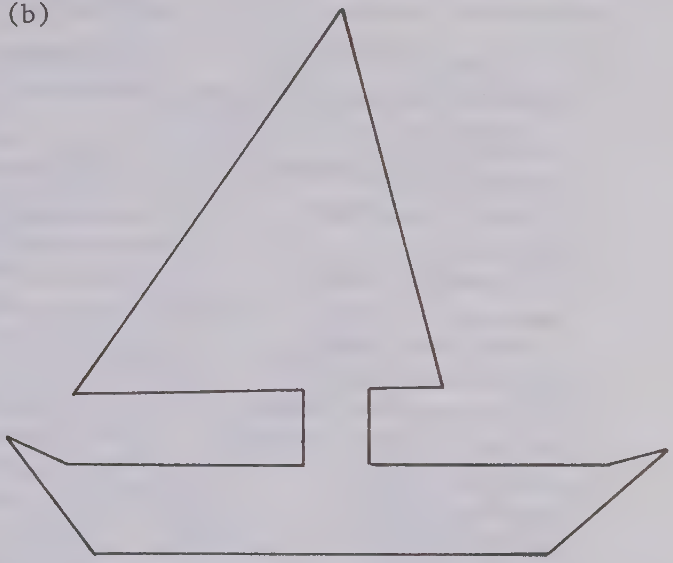
Find the perimeter of each object using the various units indicated.

(a)



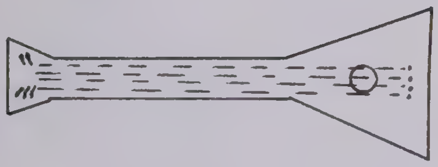
Perimeter = __________ mm

(b)



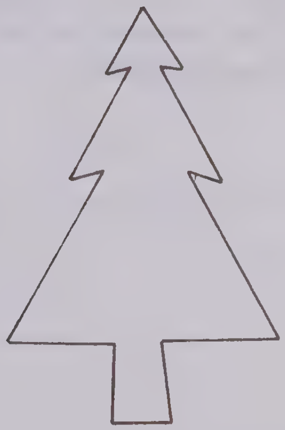
Perimeter = __________cm

(c)



Perimeter - _______ cm

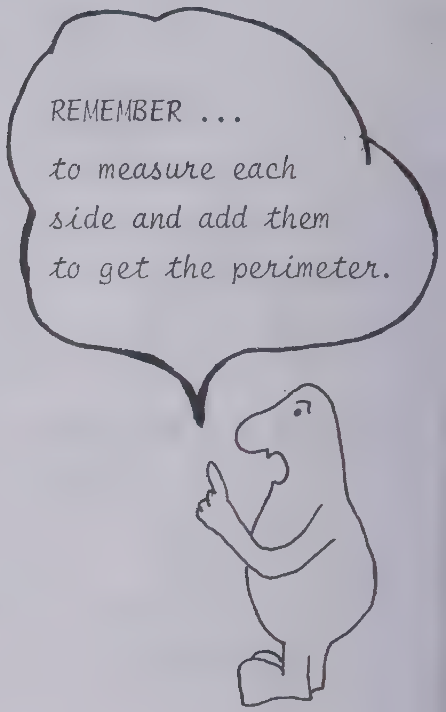
(d)



Perimeter = ______ mm

4. Class Activity: Find the perimeter of each of the items listed in the table below. Measure each item in the units indicated at the right.

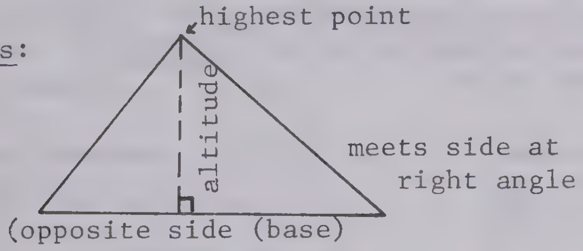
ITEM	PERIMETER
this page	________ cm
your classroom	________ m
classroom door	________ dm
the blackboard	________ m
a classroom window	________ cm
the hallway	________ m
the outside of the school	________ m


REMEMBER ...
to measure each side and add them to get the perimeter.

5. Draw a ten-sided polygon on a sheet of paper and find its perimeter. Then exchange with the person behind you and measure your partner's polygon to see if your answers agree.

An ALTITUDE is the distance from the HIGHEST POINT of a polygon to the OPPOSITE SIDE, called the base.

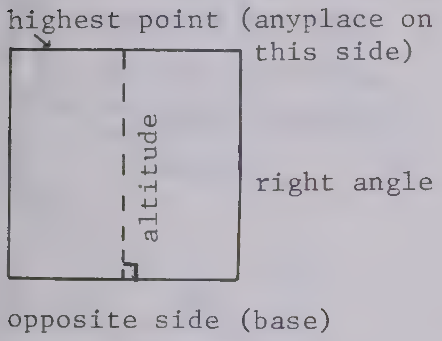
Examples:

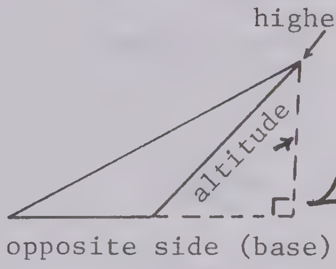


CAUTION!

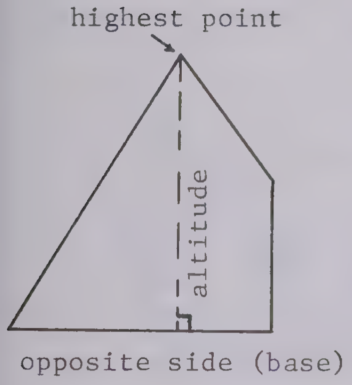
The altitude MUST meet the opposite side at a right angle.

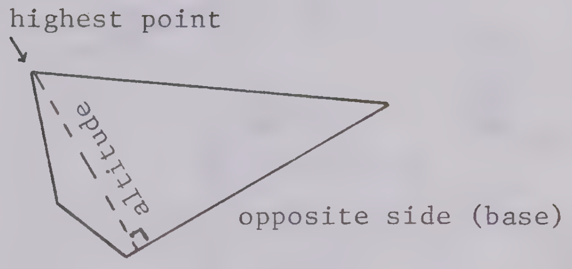
(90°)

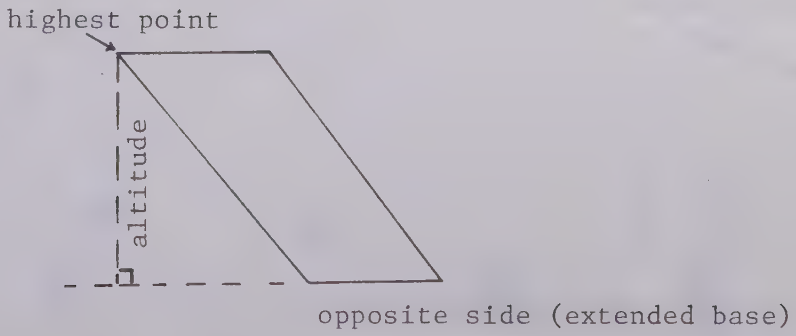




NOTE: the side had to be extended so that the altitude would meet it at 90°.





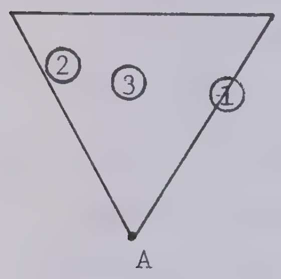


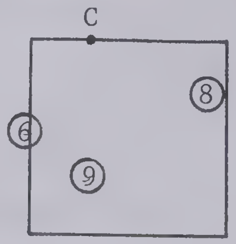
1. *"HOW DO YOU PREVENT AN ELEPHANT FROM CHARGING?"*

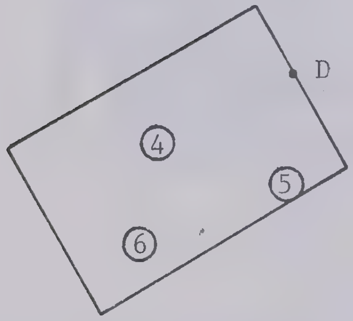
To decode the answer to this question:

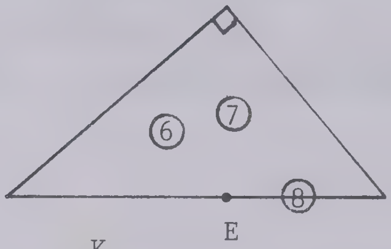
For each figure draw an altitude from the lettered point. The altitude will pass through a number. The number tells you where to write the letter that names the point in the code below.

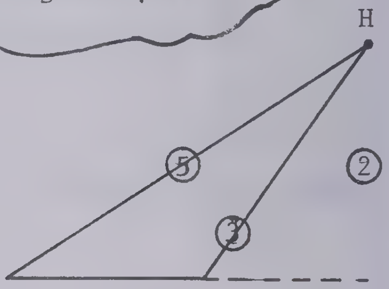
HINT: You may have to rotate the figure so that the lettered point is also the highest point.

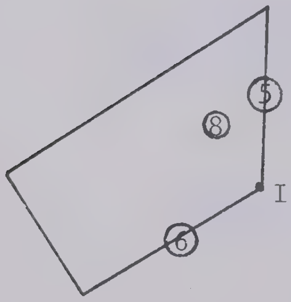


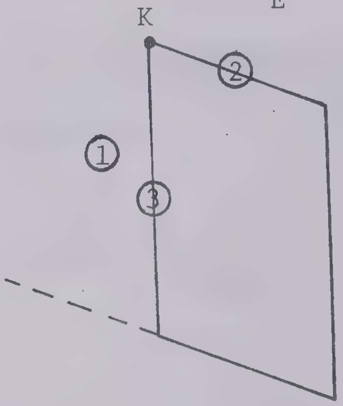


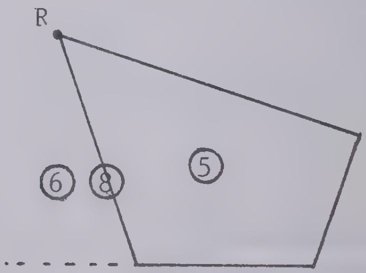


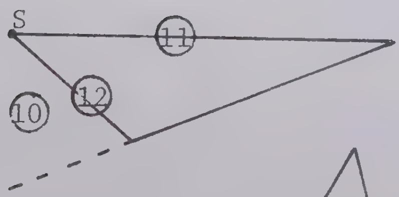


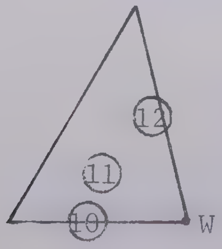


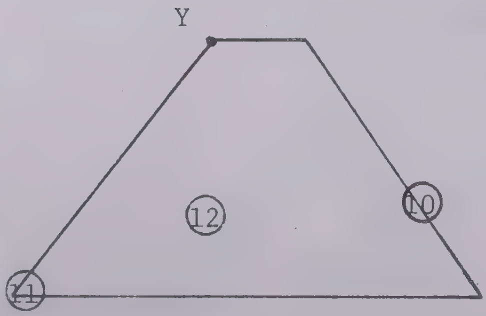


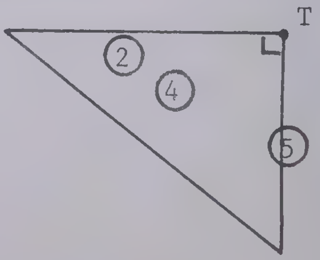












___ ___ ___ ___   ___ ___ ___ ___   ___ ___ ___
5 3 1 7   3 11 3 12   2 8 10

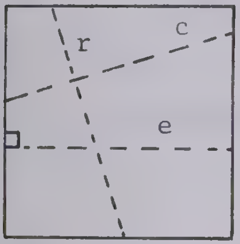
___ ___ ___ ___ ___ ___   ___ ___ ___ ___
9 6 7 4 8 5   9 3 6 4

"WHAT IS THE LEAST DANGEROUS KIND OF ROBBERY?"

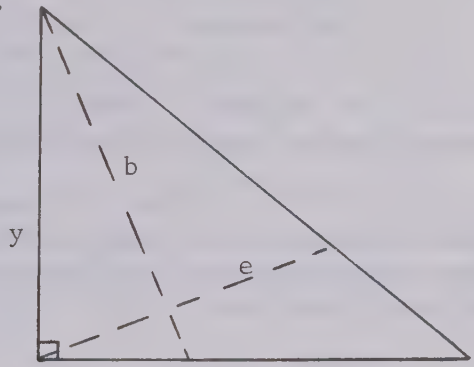
To answer this very important question:

For each figure, choose the line that is the correct altitude. The number of the question tells you where to place the letter in the code at the bottom.

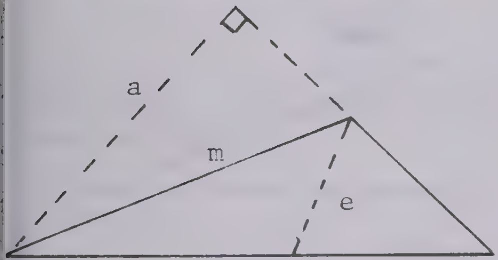
1.



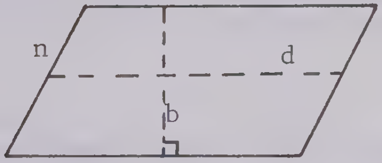
2.



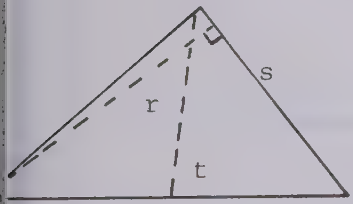
3.



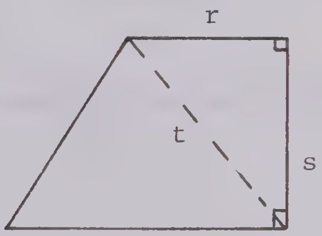
4.



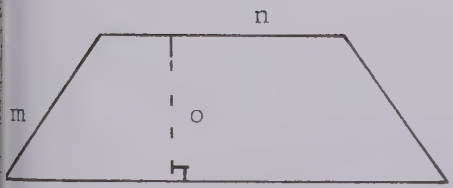
5.



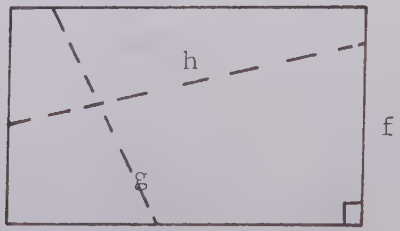
6.



7.



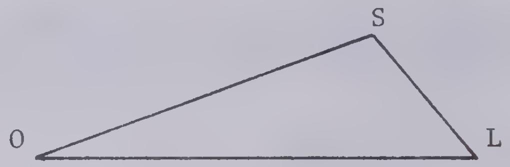
8.



___ ___ ___ ___ ___ ___ ___ ___ ___ ___

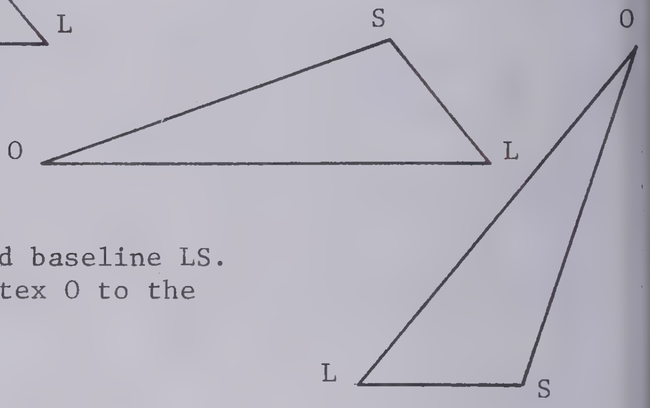
3 8 1 5 7 4 4 1 5 2

3. Mr. O.(btuse) T.(riangle) SLO wishes to become a basketball player. On which base (side) should he stand in order to be able to reach the basket most easily?

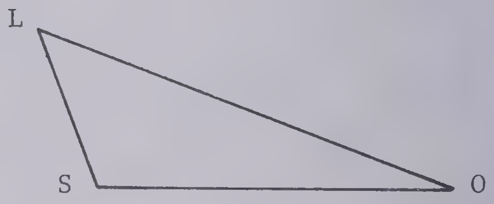


CASE 1: Use LO for the base. Sketch the altitude from S to base LO.

CASE 2: Use LS for the base. First extend baseline LS. Then sketch the altitude from vertex O to the extended baseline.



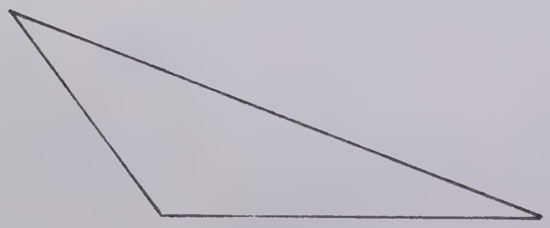
CASE 3: Use SO for the base. First extend baseline SO. Then draw an altitude from vertex L.

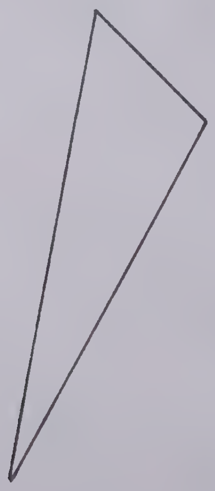


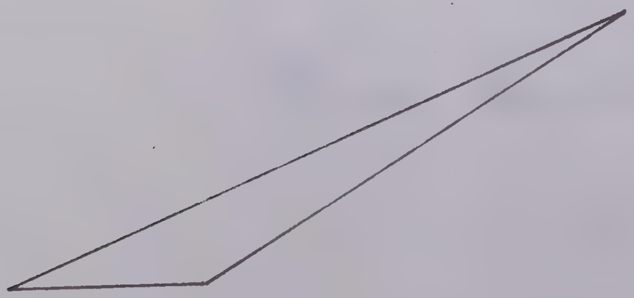
Which one of the cases gives the longest altitude? __________

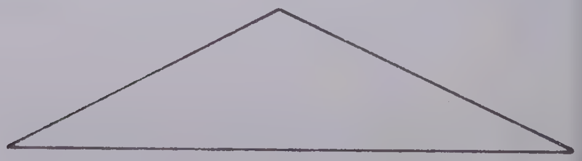
Which one of the cases would be the best basketball player? __________

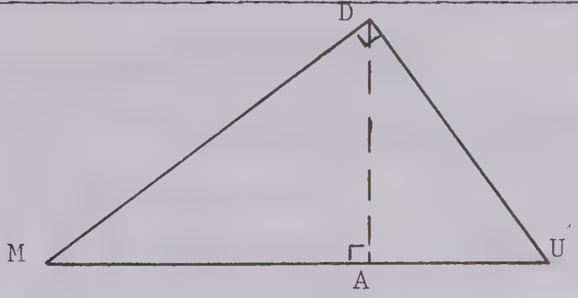
4. For each triangle draw an altitude from each vertex to the opposite side.





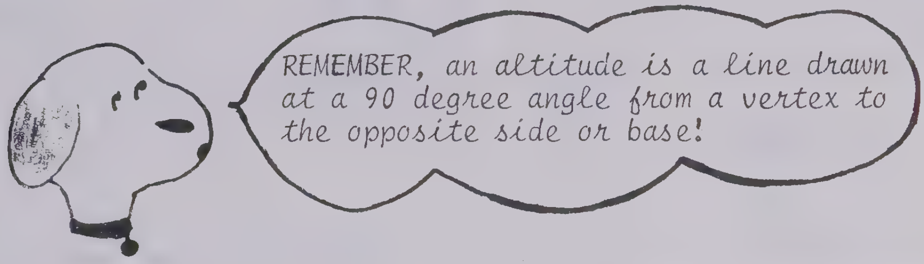




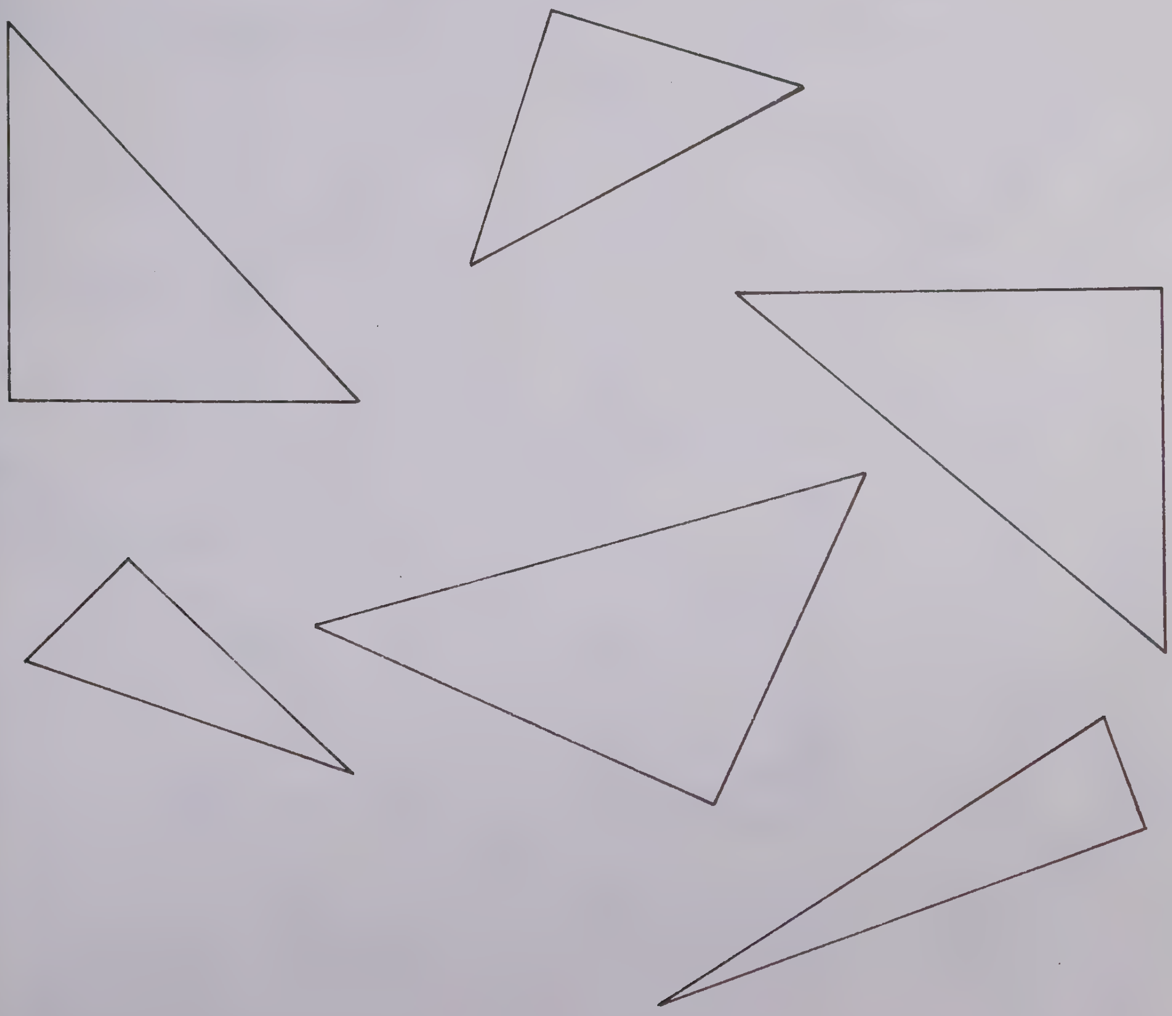


Mr. R.(ight) T.(riangle) DUM has a different problem -- he can locate only one altitude - DA. Can you help him find the other two?

Hint: The other altitudes are hiding in the sides of Mr. R. T. Dum.


REMEMBER, an altitude is a line drawn at a 90 degree angle from a vertex to the opposite side or base!

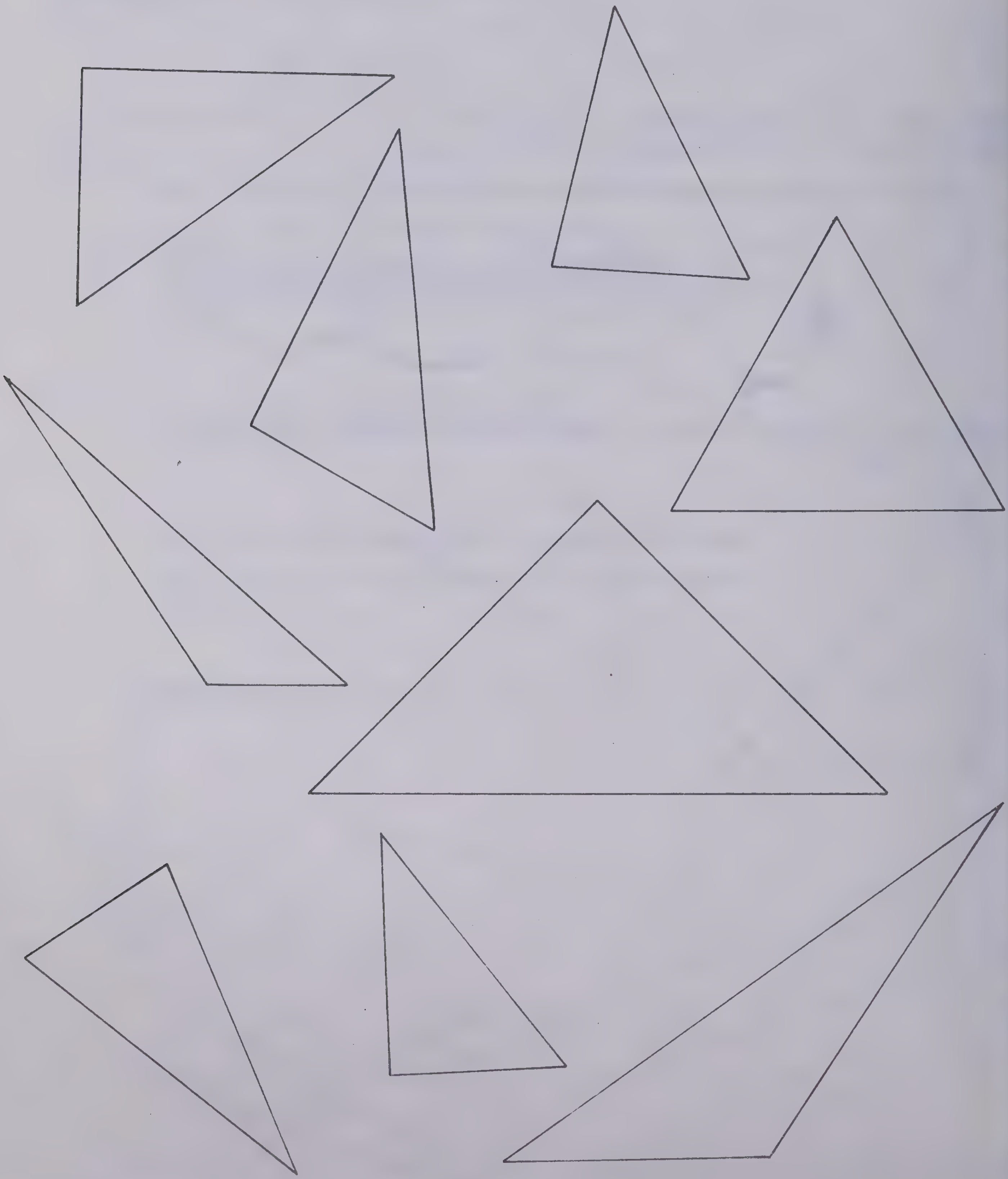
Draw three different altitudes for each triangle. Use a colored pen or pencil crayon.



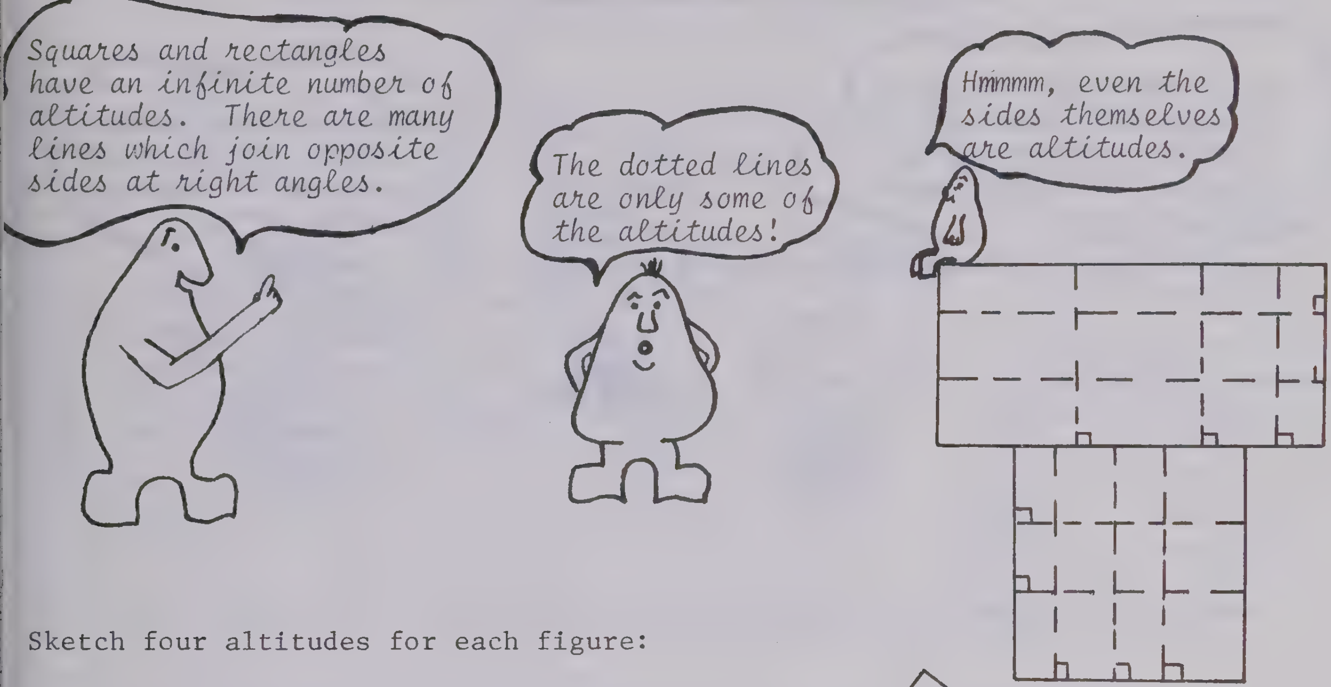
6.

TRIANGLES GALORE!

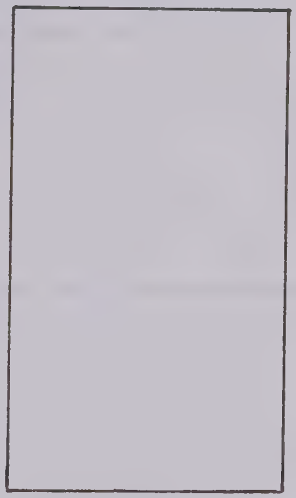
Drawn below are some acute, some right and some obtuse triangles. For each triangle, draw three different altitudes.

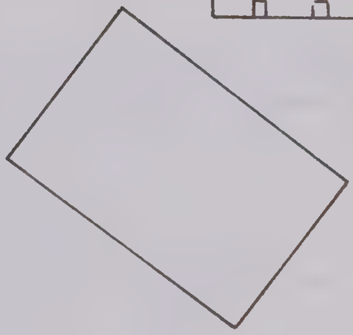


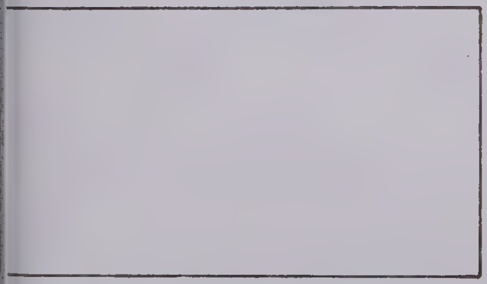
THE ALTITUDES OF SQUARES AND RECTANGLES

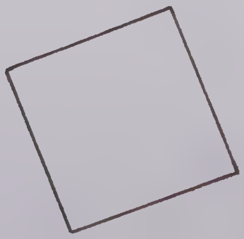

Squares and rectangles have an infinite number of altitudes. There are many lines which join opposite sides at right angles.
The dotted lines are only some of the altitudes!
Hmmmm, even the sides themselves are altitudes.

Sketch four altitudes for each figure:

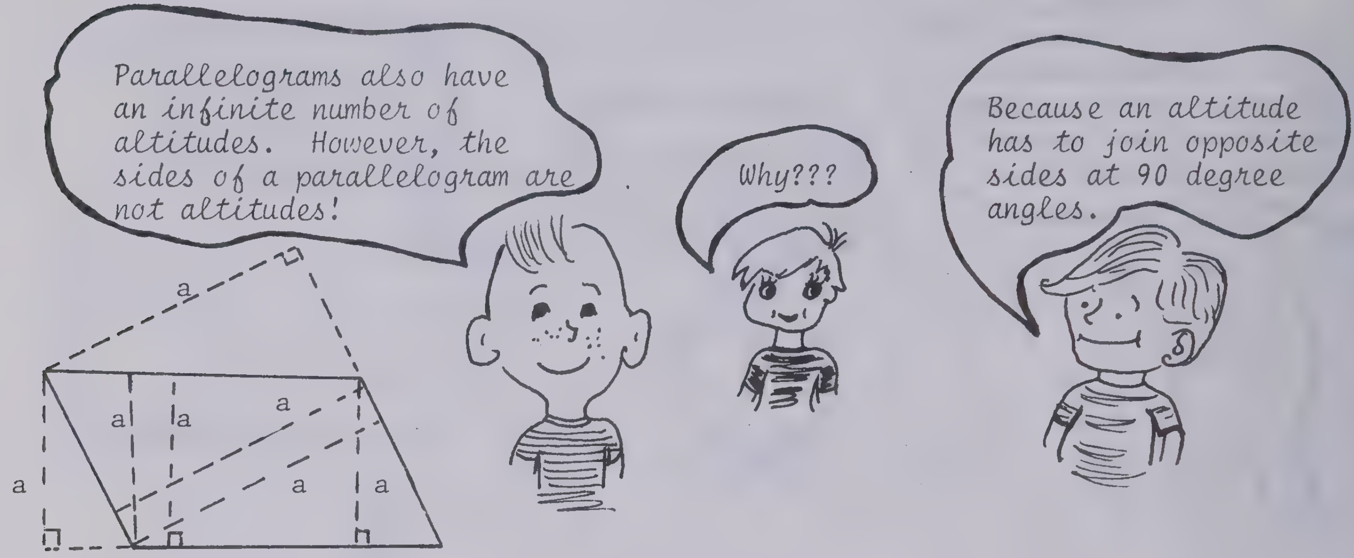




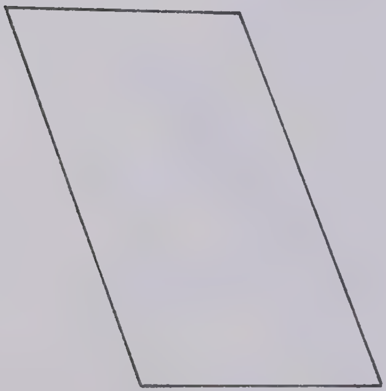


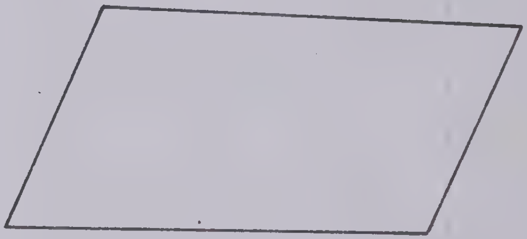


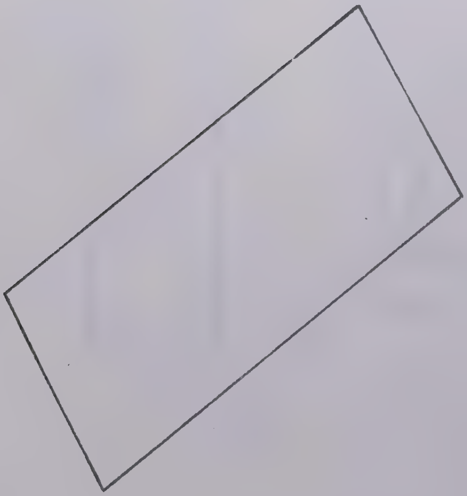
ALTITUDES OF A PARALLELOGRAM

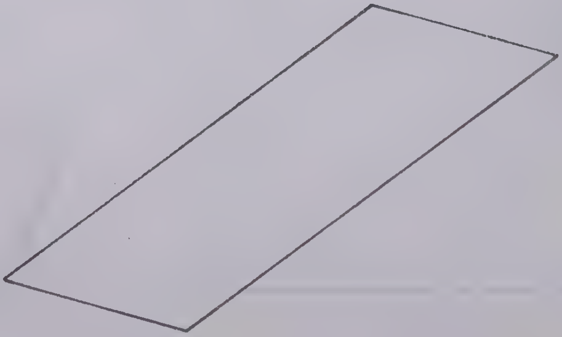

Parallelograms also have an infinite number of altitudes. However, the sides of a parallelogram are not altitudes!
Why???
Because an altitude has to join opposite sides at 90 degree angles.
a
a
a
a
a
a
a

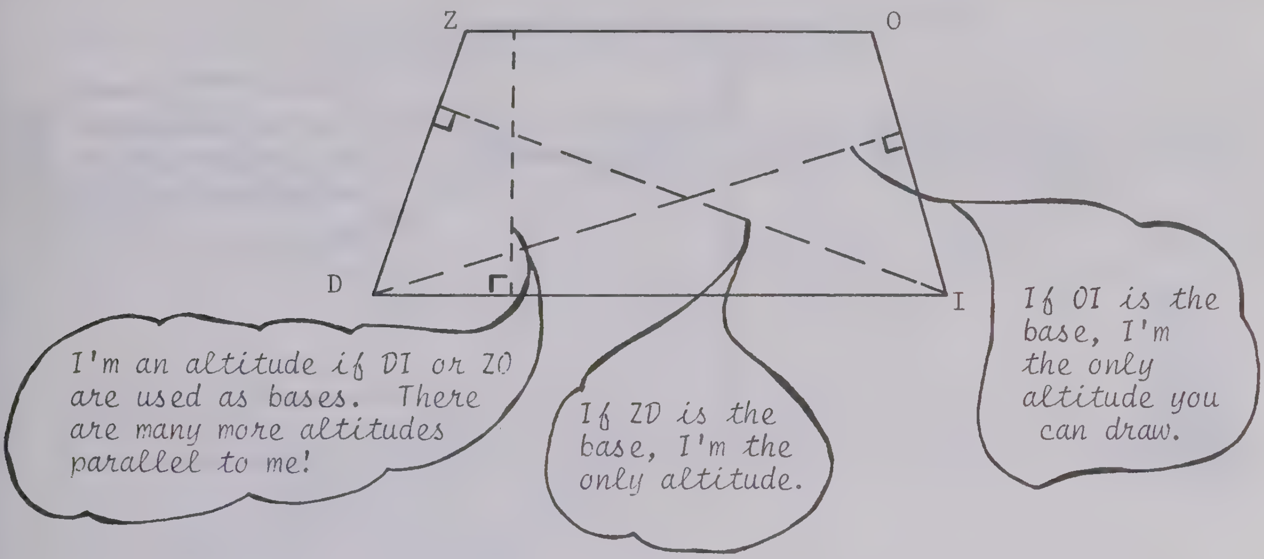
8. For each parallelogram, sketch two different altitudes.



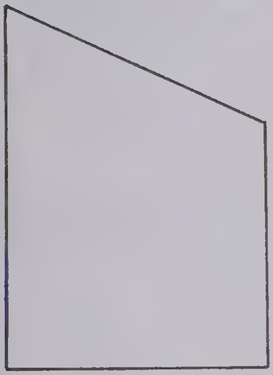


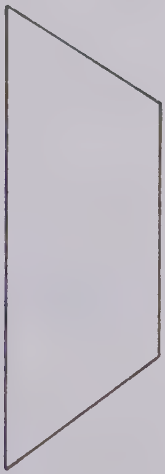


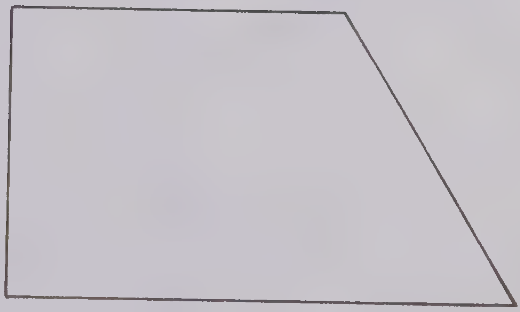


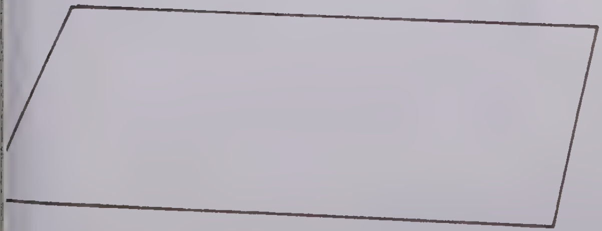

Z
O
D
I
I'm an altitude if DI or ZO are used as bases. There are many more altitudes parallel to me!
If ZD is the base, I'm the only altitude.
If OI is the base, I'm the only altitude you can draw.

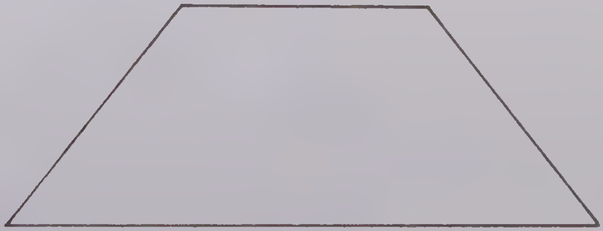
For each trapezoid, sketch an altitude to each base. You may find that using different colored pens or pencils for each altitude will make your task easier.



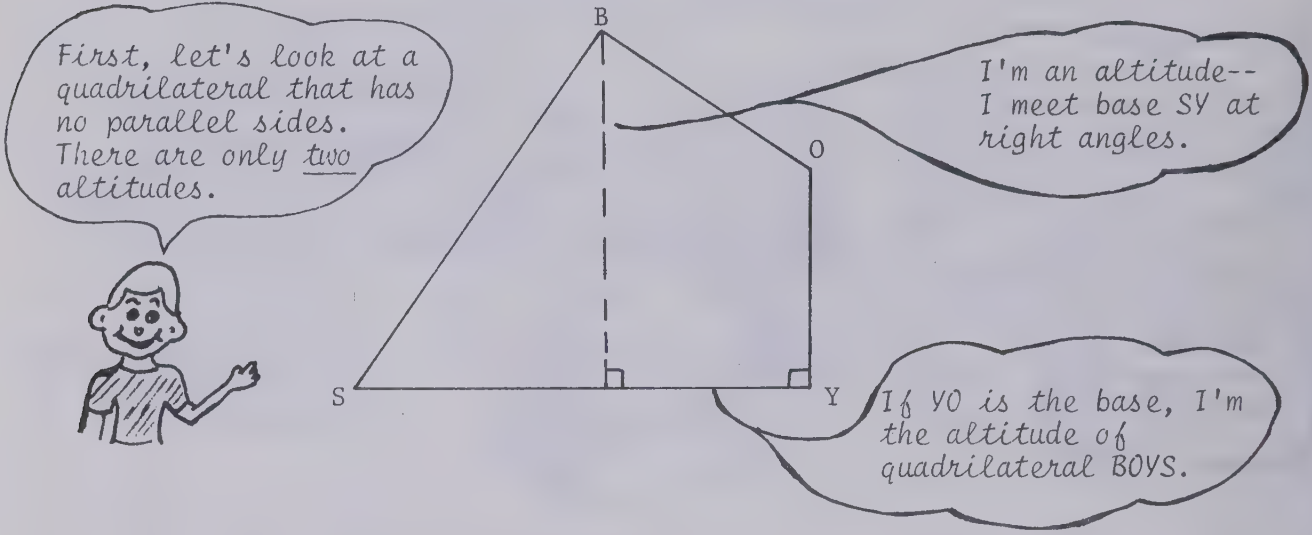








THE ALTITUDES OF QUADRILATERALS

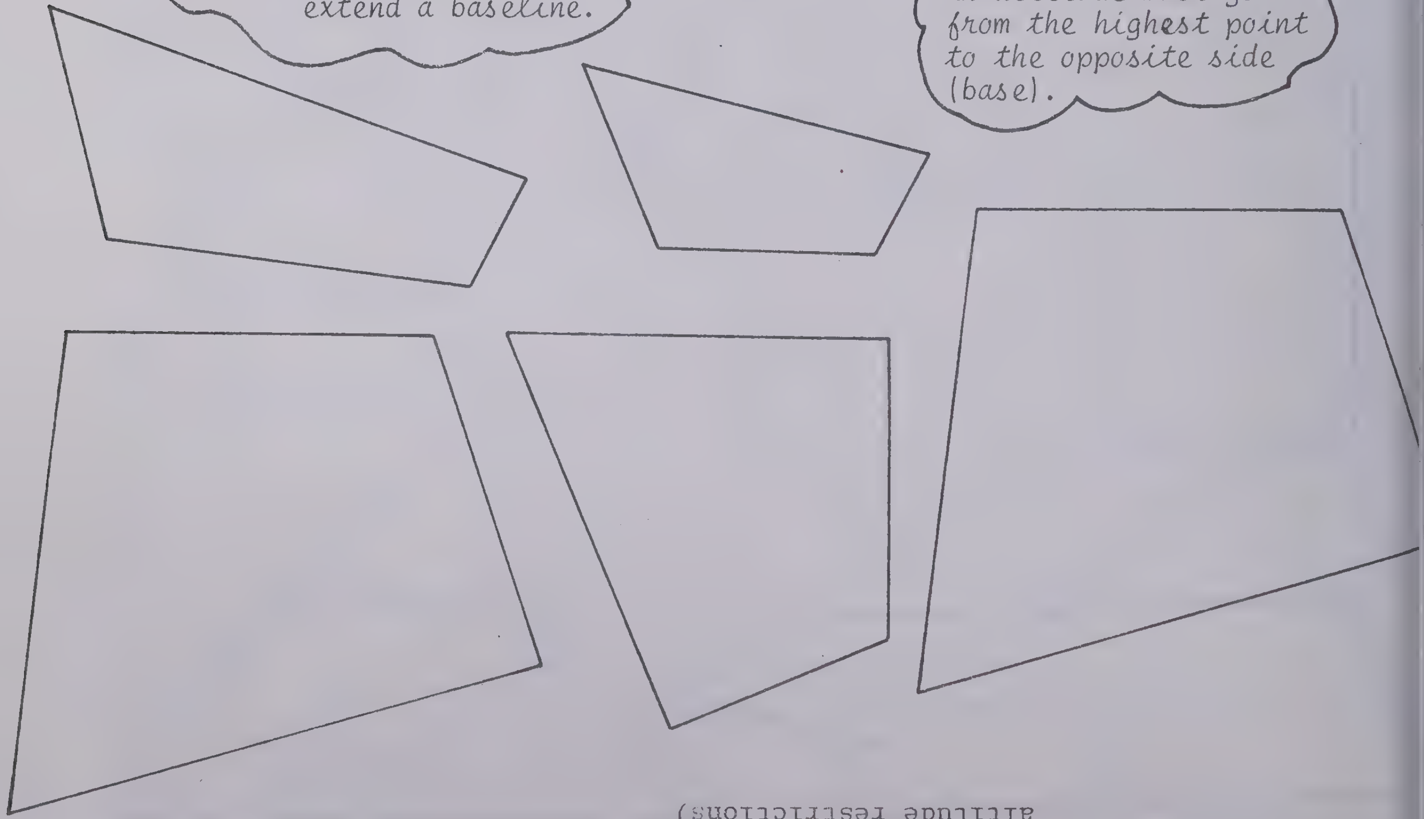

First, let's look at a quadrilateral that has no parallel sides. There are only two altitudes.
B
O
S
Y
I'm an altitude-- I meet base SY at right angles.
If YO is the base, I'm the altitude of quadrilateral BOYS.

Question: Why is OY not an altitude

10. Use colored pen or pencil to sketch two altitudes for each of these quadrilaterals.

Hint: you may have to extend a baseline.

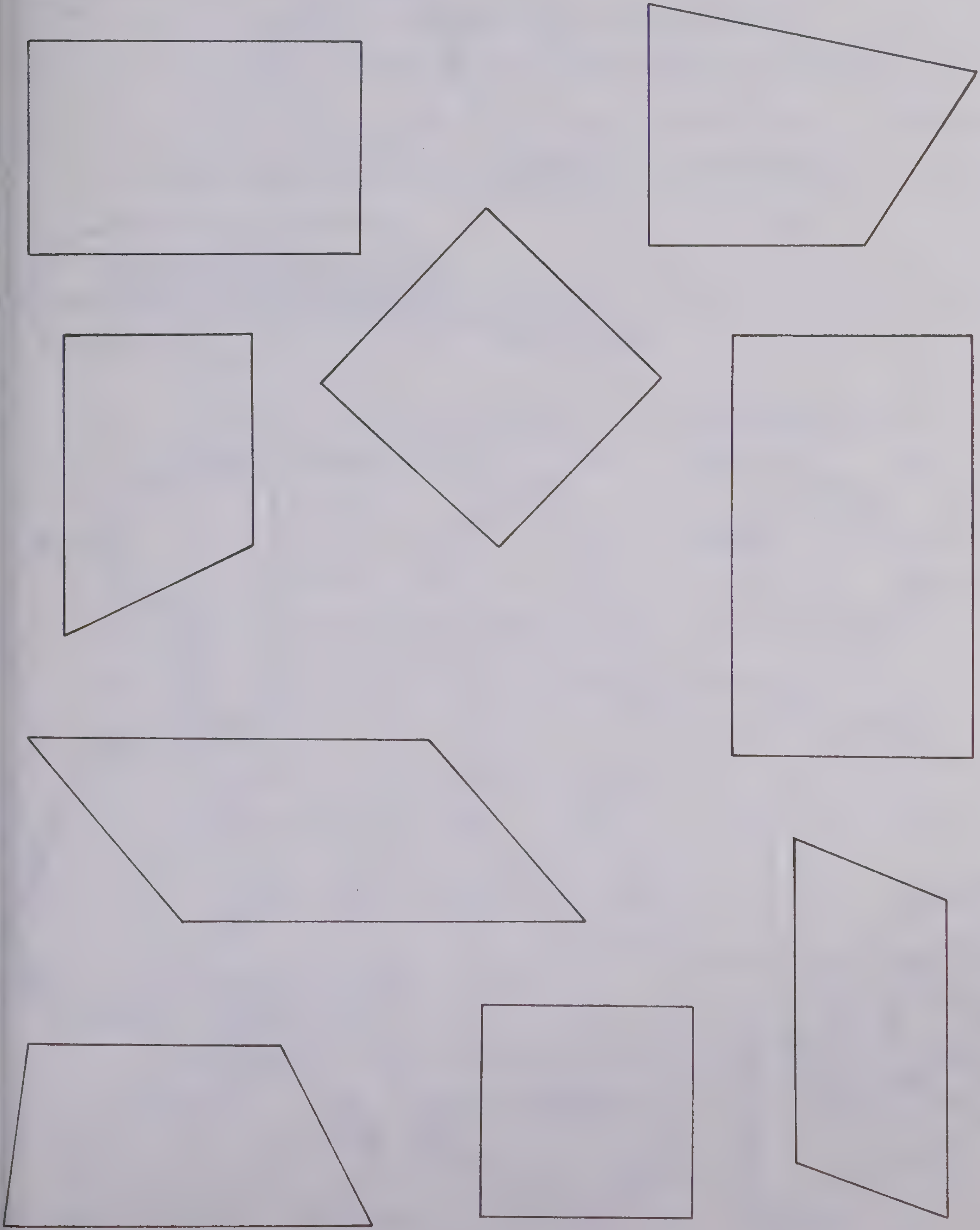
REMEMBER ...
An altitude must go from the highest point to the opposite side (base).



Answer to Question: Point B is farther from the base SY. (Rule #3 of the altitude restrictions)

QUADRILATERALS GALORE!

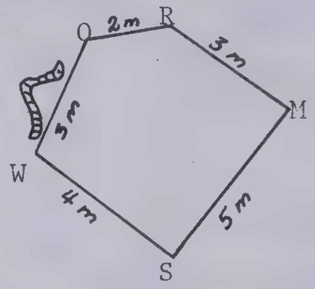
Drawn below are all the different quadrilaterals you have studied -- squares, rectangles, parallelograms, trapezoids. For each one, draw two different altitudes.



A. PERIMETER OF A POLYGON

Perimeter of an irregular polygon:

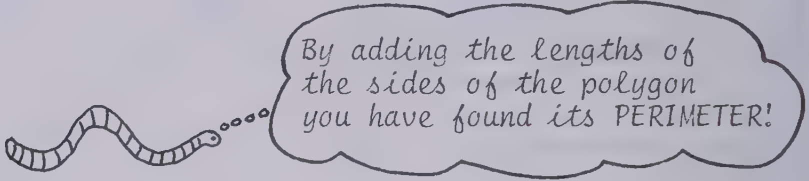
Example: How far will the "meterpede" crawl if he travels all the way around pentagon WORMS?



Solution: $P = s_1 + s_2 + s_3 + s_4 + s_5$

$= 3m + 2m + 3m + 5m + 4m$

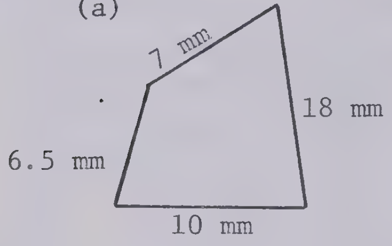
$= 17m$



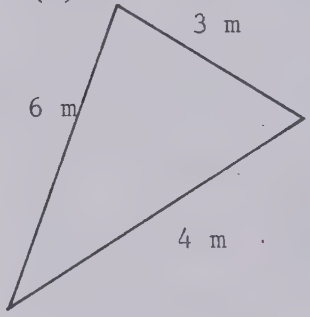
By adding the lengths of the sides of the polygon you have found its PERIMETER!

1. Find the perimeter of these polygons:

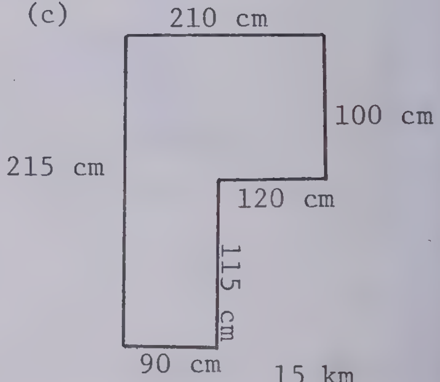
(a)



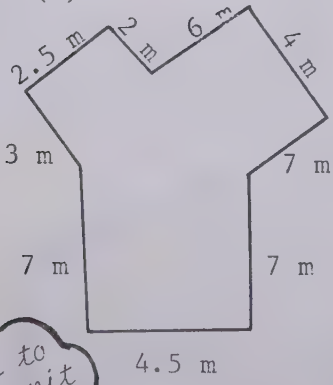
(b)



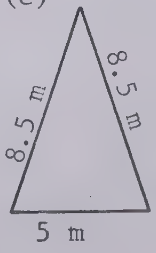
(c)



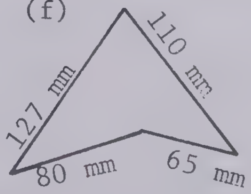
(d)



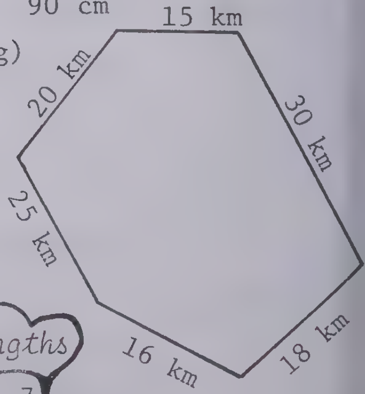
(e)

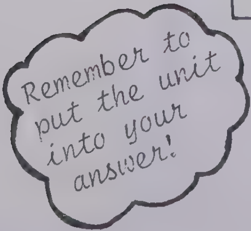


(f)



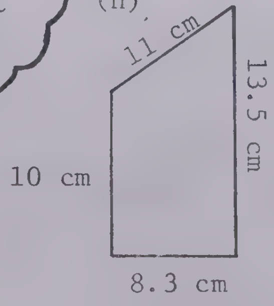
(g)



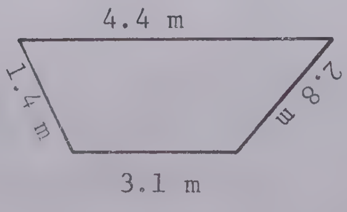


Remember to put the unit into your answer!

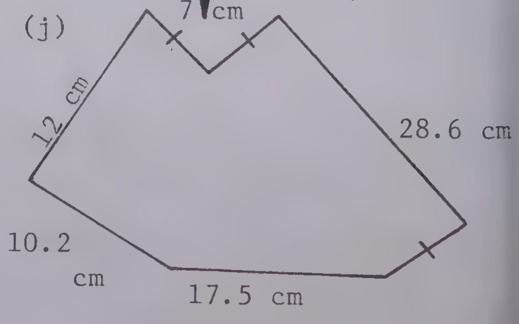
(h)



(i)



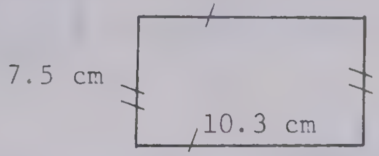
(j)



Perimeter of a rectangle

Hmm...A rectangle has opposite sides congruent, doesn't it?

Example: Find the perimeter of this rectangle:



Solution: A formula for the perimeter of a rectangle is

$P = 2\ell + 2w$, where ℓ is the length and w is the width.

STEP 1

Multiply the length, ℓ, by 2. 2×10.3 cm $= 20.6$ cm

STEP 2

Multiply the width, w, by 2 2×7.5 cm $= 15.0$ cm

STEP 3

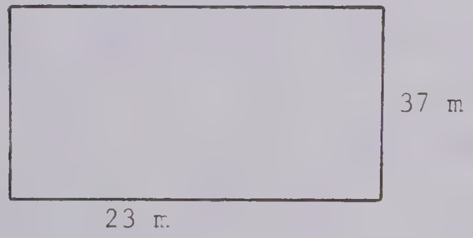
Add products found in Steps 1 and 2.

$$\begin{array}{r} 20.6 \text{ cm} \\ + \underline{15.0 \text{ cm}} \\ 35.6 \text{ cm} \end{array}$$

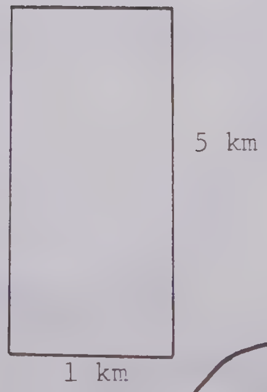
Therefore, P = 35.6 cm.

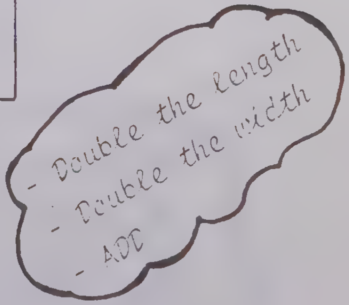
2. Find the perimeter of these rectangles:

(a)

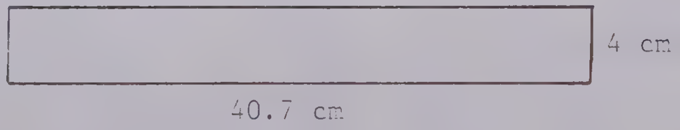


(b)





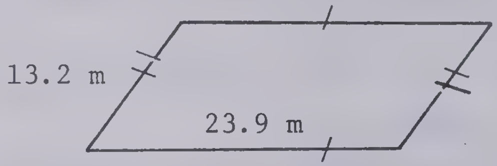
(c)



Perimeter of a parallelogram

Opposite sides of a parallelogram are congruent.

Example: Find the perimeter of this parallelogram:



Solution: A formula for the perimeter of a parallelogram is

$P = 2b + 2c$, where b is the base and c is the slanted side.

STEP 1

Multiply the base b, by two.	2 x 23.9 m = 47.8 m

STEP 2

Multiply the slanted side, c, by two.	2 x 13.2 m = 26.4 m

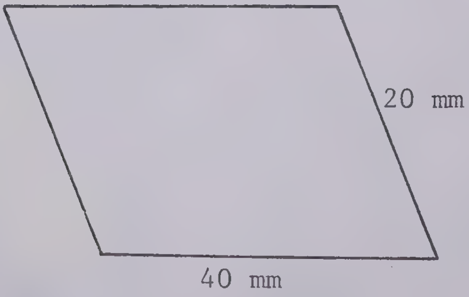
STEP 3

Add the products you found in Steps 1 and 2.	$\begin{array}{r} 47.8 \text{ m} \\ + \underline{26.4 \text{ m}} \\ 74.2 \text{ m} \end{array}$

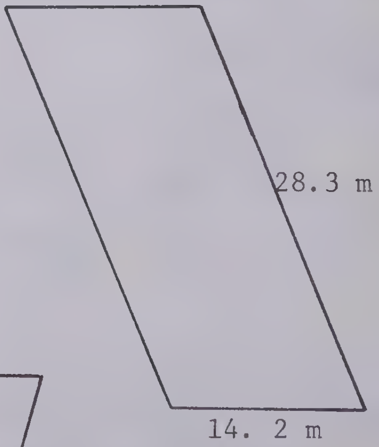
Therefore, P = 74.2 m.

3. Find the perimeter of these parallelograms:

(a)

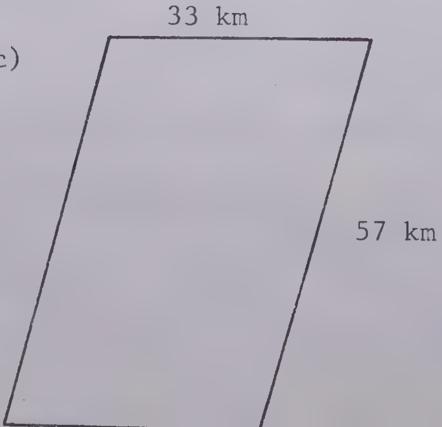


(b)



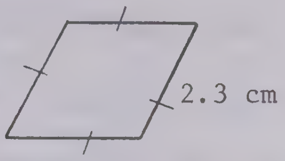
- Double the base
- Double the slanted side
- ADD

(c)



Perimeter of regular polygons

Example: Find the perimeter:



Solution: If the polygon is one in which all sides are congruent, (equal in length) you can use this formula to calculate the perimeter:

P = ns where n is the number of sides in the polygon,
s is the length of one of the sides.

STEP 1

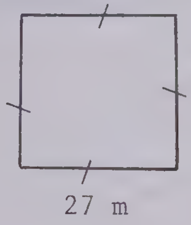
Count the number of sides in the polygon.	A rhombus has 4 sides.

STEP 2

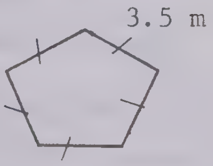
Multiply this number by the length of one side.	4×2.3 cm = 9.2 cm

4. Find the perimeter of these polygons.

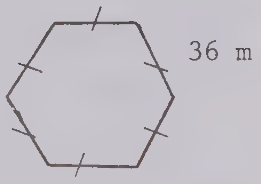
(a)



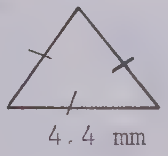
(b)



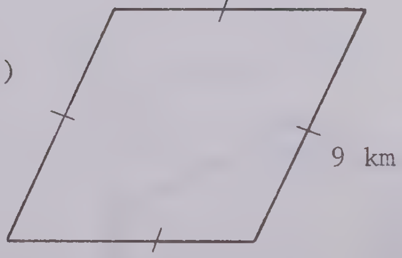
(c)



(d)



(e)



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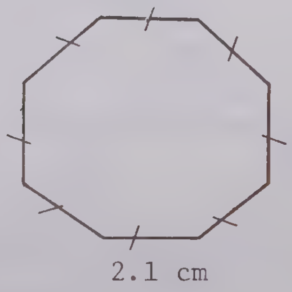
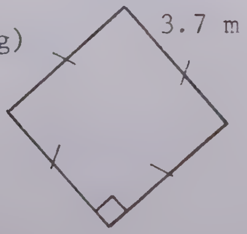
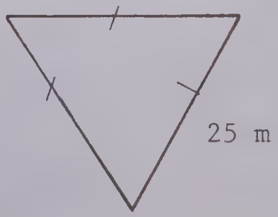


(g)



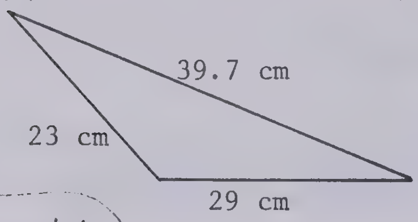
(h)



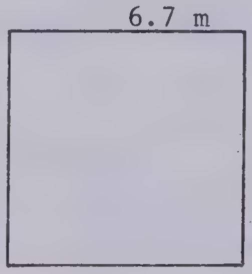
5. Review Exercise:

Find the perimeter of each polygon.

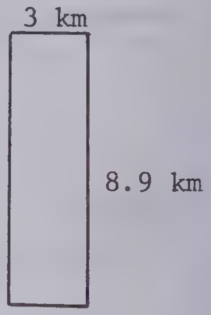
(a)



(b)

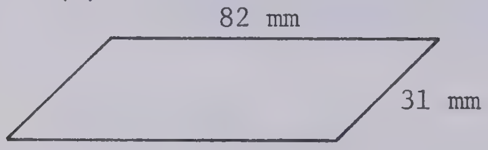


(c)



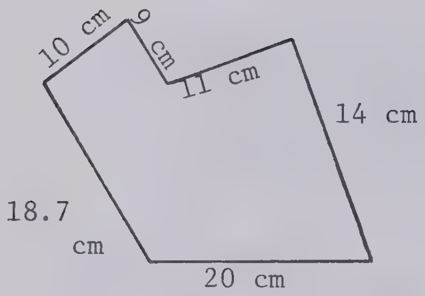
REMEMBER..
P = sum of sides

(d)

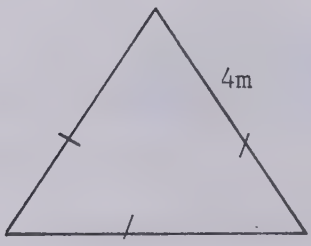


P = 2ℓ + 2w for rectangles
P = 2b + 2c for parallelograms

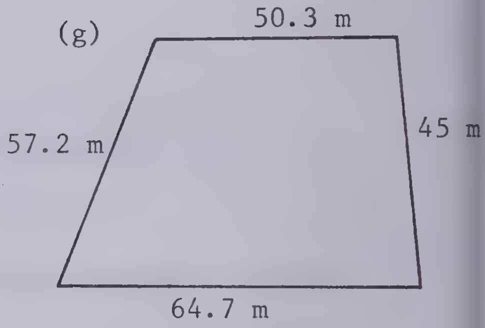
(e)



(f)

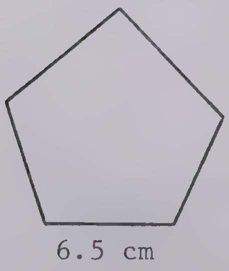


(g)

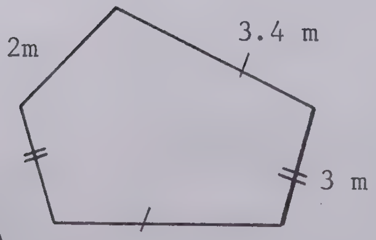


If a polygon has congruent sides, P = ns

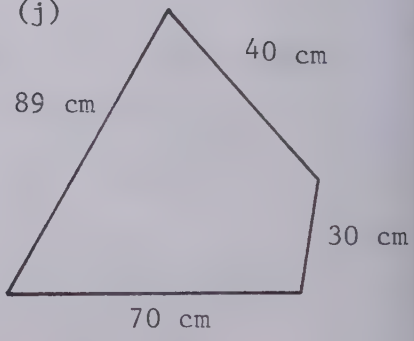
(h)



(i)



(j)



Formulas are convenient shortcuts.

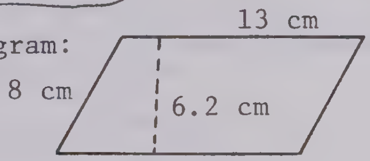
. AREA OF A POLYGON

Area of rectangles, parallelograms, squares and rhombii:

DEFINITION: Area - the number of square units within a figure.

Instead of counting squares shortcuts are used.

Example: Calculate the area of this parallelogram:



STEP 1

Find the altitude of the figure.

Altitude = ____________

STEP 2

Find the base of the figure.

Base = ______________

STEP 3

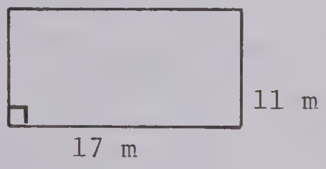
Multiply base and altitude to find the area.

Formula for area of rectangles, squares, parallelograms and rhombii

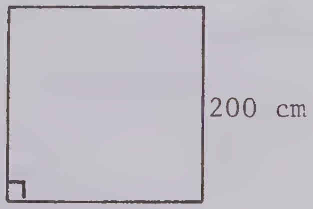
A = ab

1. Find the area of these polygons:

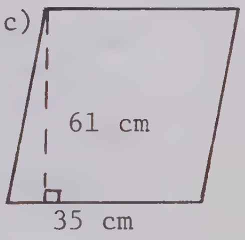
(a)



(b)

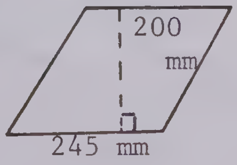


(c)

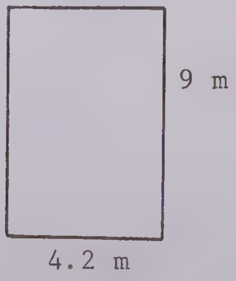


ude x base

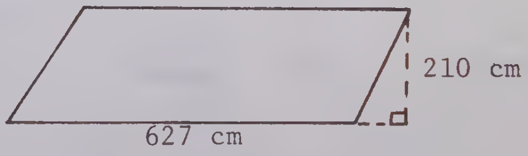
(d)



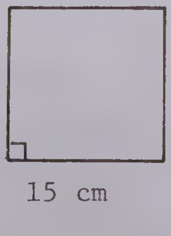
(e)



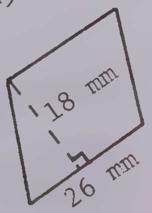
(f)



(g)



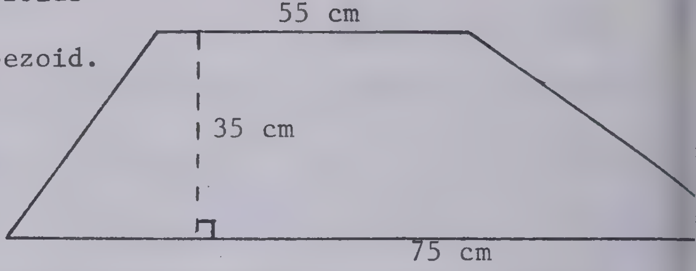
(h)



Remember that area is given in square units!!

Area of trapezoids

Example: Find the area of this trapezoid.



Solution: Formula is: $A = \frac{1}{2}a(b_1 + b_2)$, a = altitude

b_1, b_2 = parallel sides

REMEMBER... do brackets first!

STEP 1

Add the lengths of the parallel bases. 55 cm + 75 cm = 130 cm

STEP 2

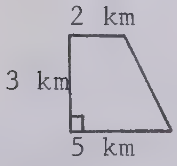
Multiply this sum by the altitude 130 cm x 35 cm = 4 550 cm^2

STEP 3

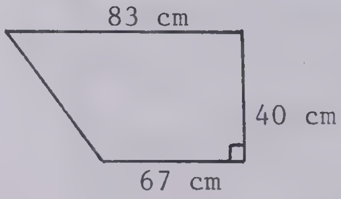
Multiply this product by $\frac{1}{2}$ 4550 sq cm x $\frac{1}{2}$ = 2 775 cm^2

2. Find the area of these trapezoids:

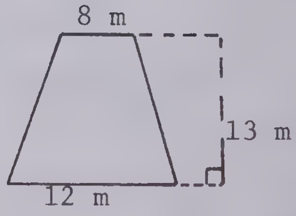
(a)



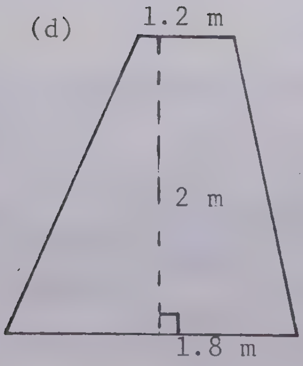
(b)



(c)



(d)



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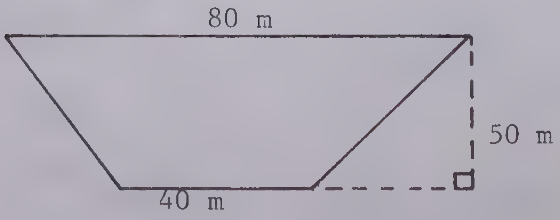
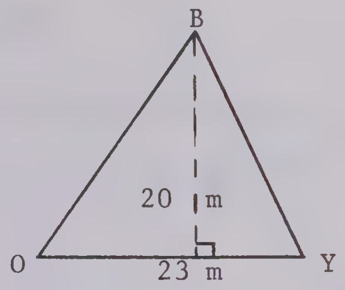


Area of triangles

Example: Find the area of ΔBOY.



Solution: A formula for the area of a triangle is $A = \frac{1}{2}ab$

STEP 1

Multiply the altitude by the base.

$20 \times 23 = 460\ m^2$

STEP 2

Multiply this product by one half.

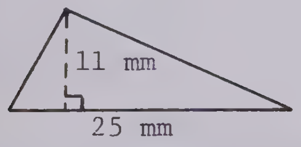
$\frac{1}{2} \times 460 = 230\ m^2$

STEP 3

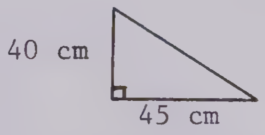
$A = 230\ m^2$.

3. Find the area of these triangles.

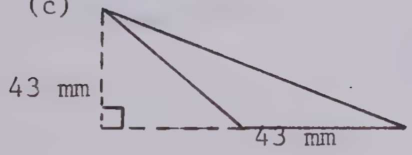
(a)



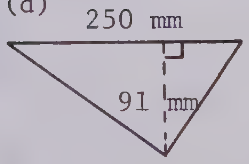
(b)



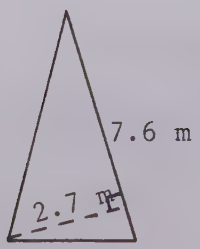
(c)



(d)



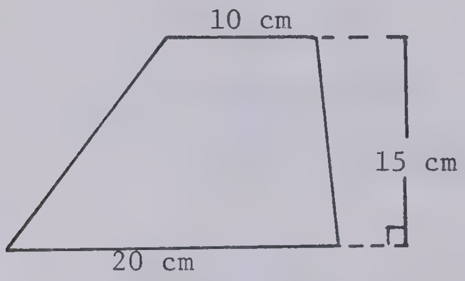
(e)



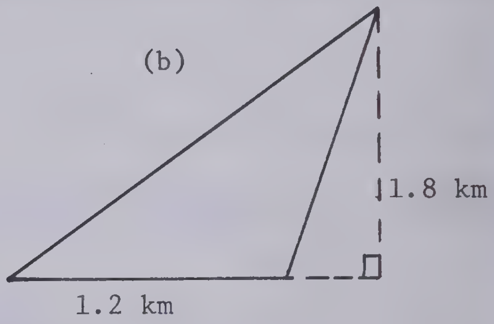
REVIEW EXERCISES

1. Calculate the area of these polygons:

(a)

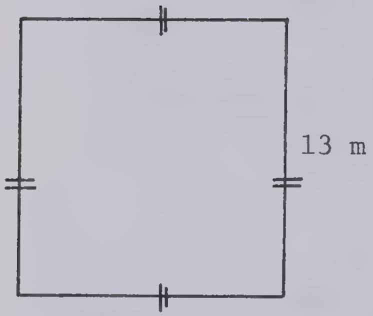


(b)

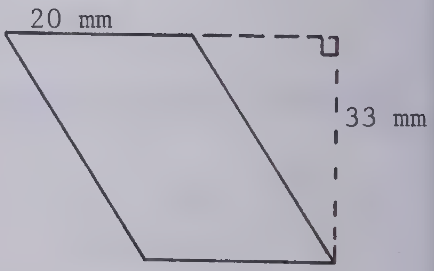


Area of 4-sided figures, except trapezoids, is found by $A = ab$

(c)

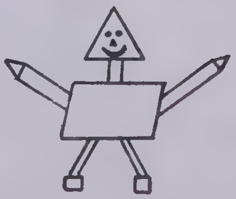


(d)

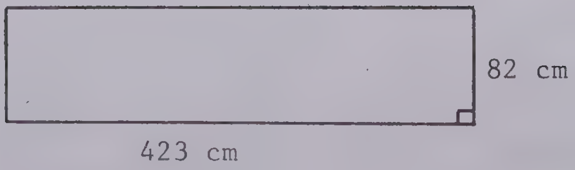


$A = \frac{1}{2}a(b_1 + b_2)$ *gives the area of a trapezoid.*

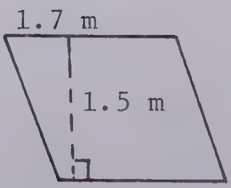
Area of a triangle is given by $A = \frac{1}{2}ab$.



(e)



(f)

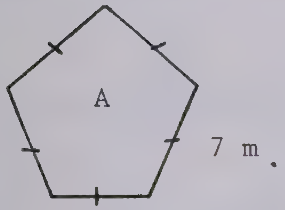


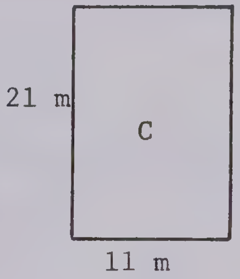
2.

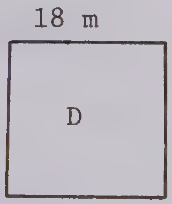
A FREE PAIN

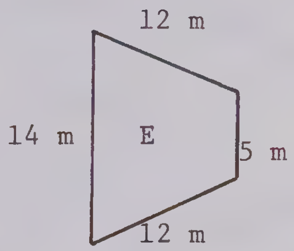
HOW CAN YOU HAVE A SET OF TEETH INSERTED FREE?

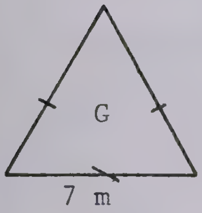
Calculate the perimeter of each polygon. Find the answer in the code below and replace it with the letter of the polygon.

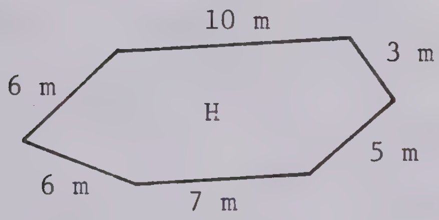


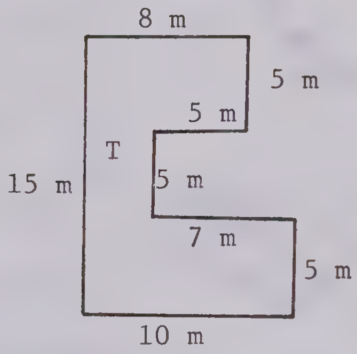


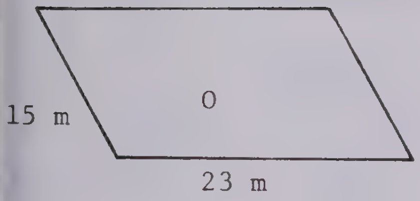


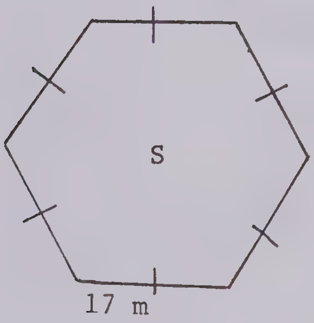


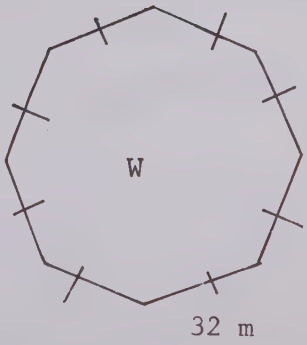












0 m 43 m 35 m 102 m 43 m 35 m

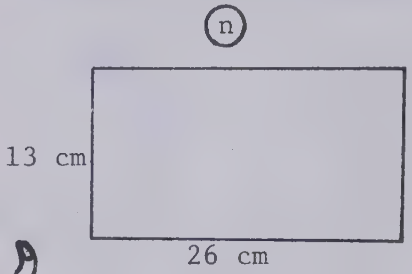
56 m 35 m 60 m 64 m 37 m 72 m 76 m 21 m

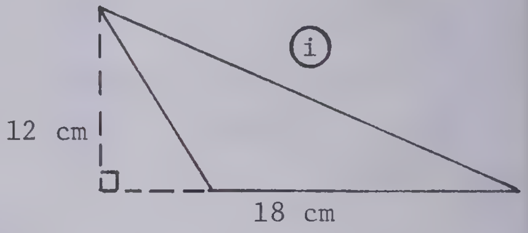
3.

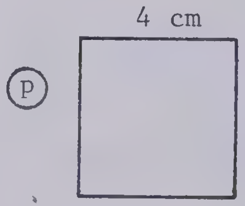
ELE-FUN-T-AREA

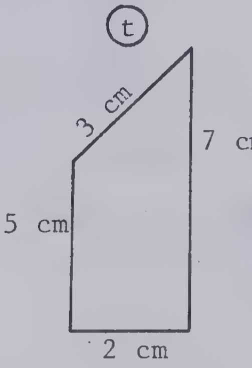
WHY DO ELEPHANTS WEAR SNEAKERS?

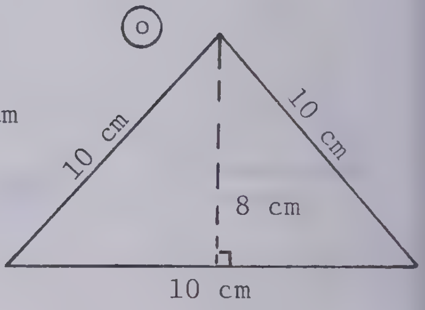
To find the answer to this riddle, calculate the area of the given polygons. Find the answer below and place the letter of the polygon on the blank line.

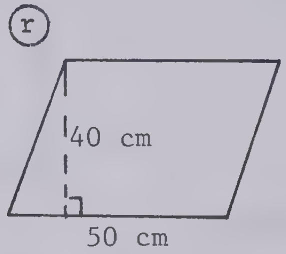


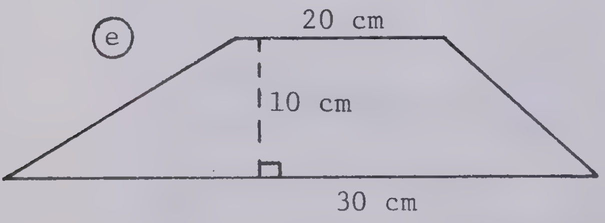


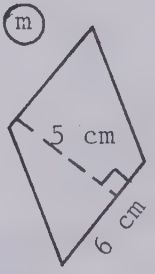


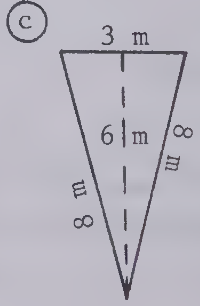


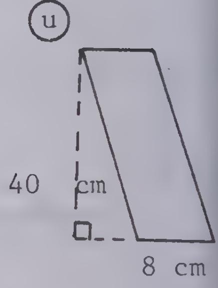












____ 12 sq cm ____ 40 sq cm ____ 9 sq cm ____ 2000 sq cm ____ 250 sq cm ____ 250 sq cm ____ 16 sq cm

____ 320 sq cm ____ 16 sq cm ____ 40 sq cm ____ 338 sq cm

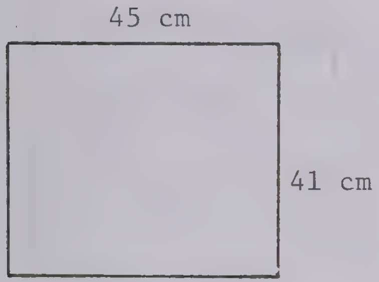
____ 30 sq cm ____ 108 sq cm ____ 9 sq cm ____ 250 sq cm

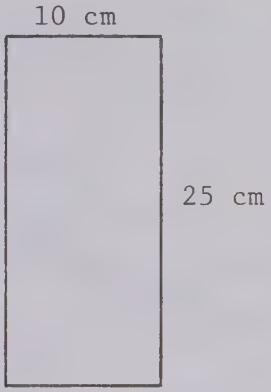
DAFFYNITION:

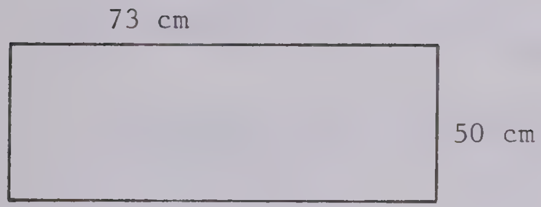
A BUNCH OF NOTHING ??

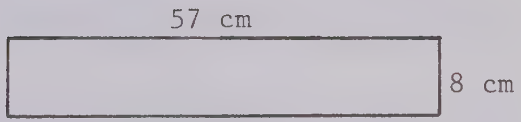
Find the perimeter and area of each rectangle. Find your answer in the list at the bottom and shade out the letter above each correct answer.

The letters not shaded out will spell out the answer to the daffynition.





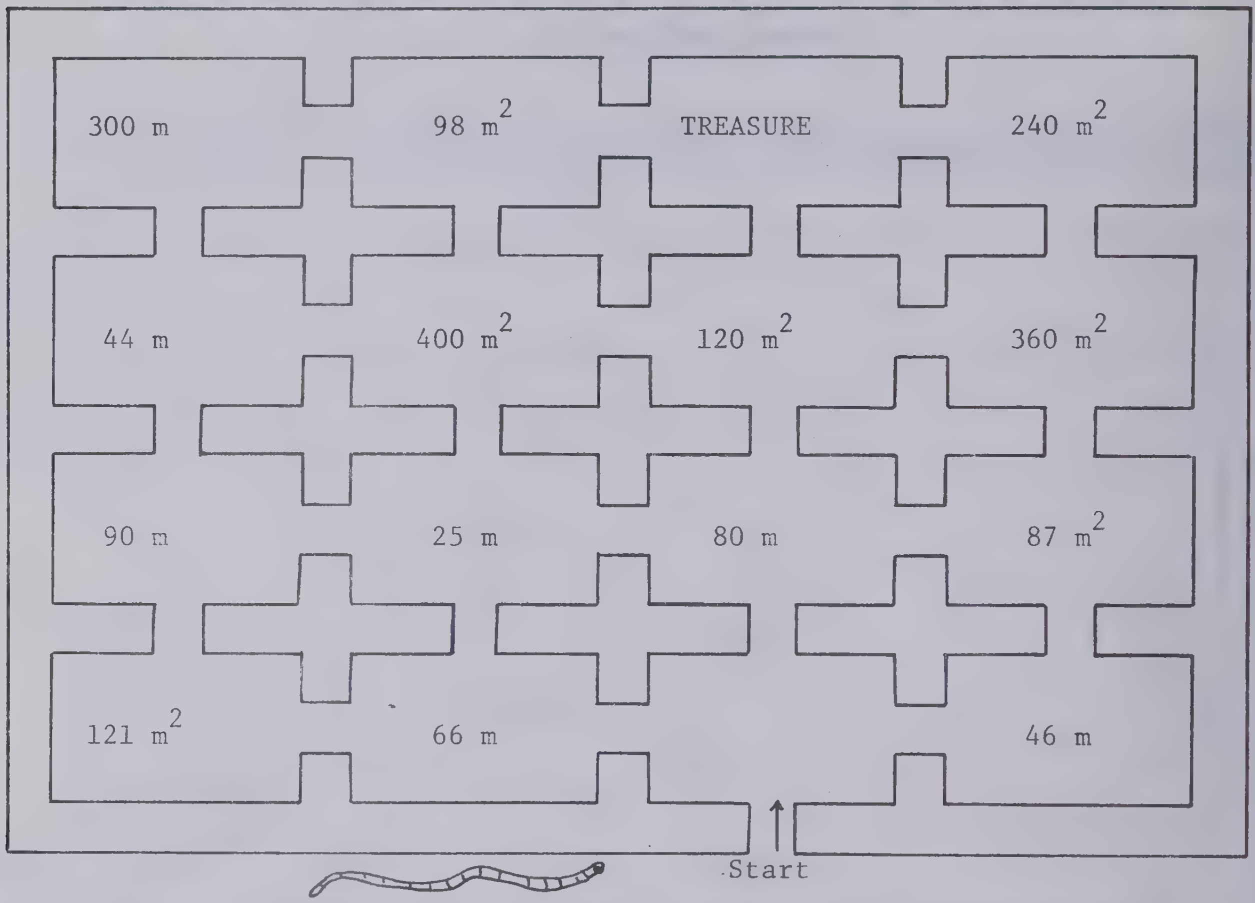




A	M	P	V	A	U	C	A	R	N	T	Y	L	O	K	S	T
35 cm	130 cm	3650 sq cm	280 sq cm	86 cm	172 cm	65 cm	190 sq cm	246 cm	46 sq cm	123 cm	250 sq cm	1600 sq cm	400 sq cm	456 sq cm	1845 sq cm	481 cm

Daze of the Meterpede

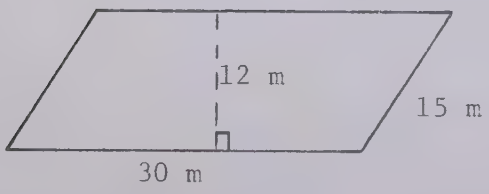
5.



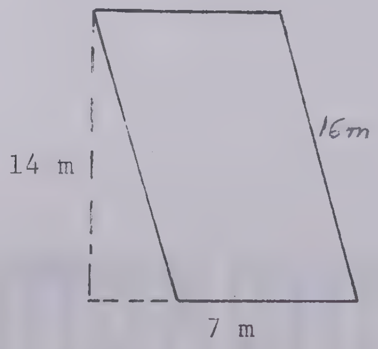
Calculate the perimeter and area of each figure below. Find and circle your answer in the rooms of the above maze.

Trace a path, leading to the treasure, that passes only through the correct answers.

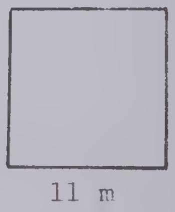
(a)



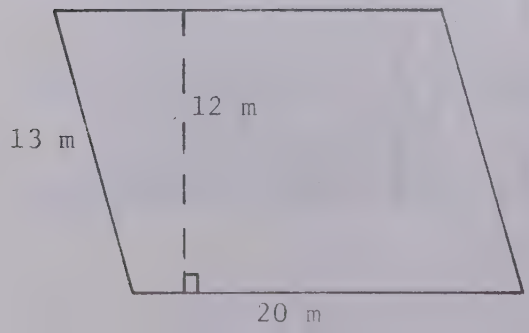
(b)



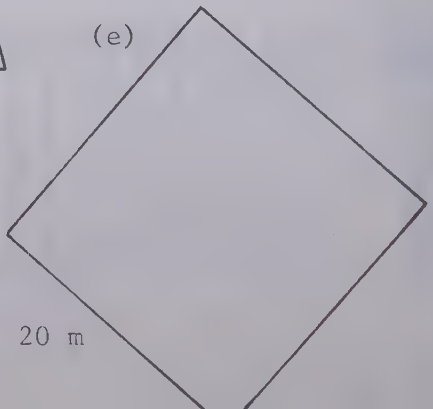
(c)



(d)



(e)



6.

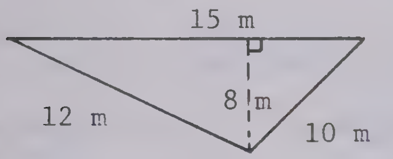
A PENNILESS PROBLEM

WHAT IS ALWAYS OUT OF CASH AND ALWAYS IN DEBT AND GREAT DANGER?

Calculate the perimeter and area of each triangle.

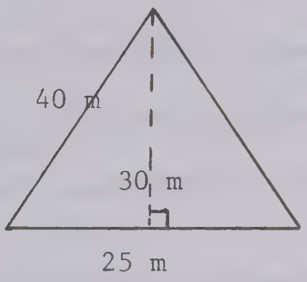
Find each answer in the rectangle below and cross it out. Ten boxes will not be crossed out.

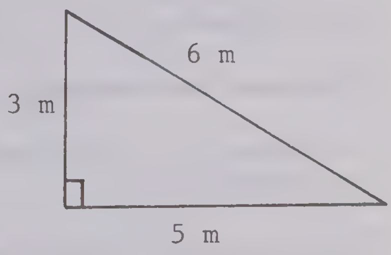
Start with the top line and going from left to right, print the letters that remain into the boxes at the bottom. The first one is done for you.

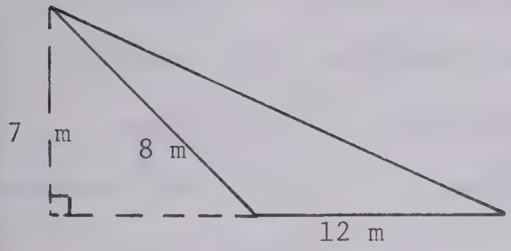


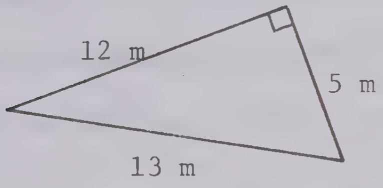
P = 15 + 10 + 12 = 37 m

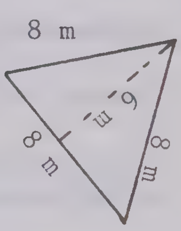
$A = \frac{1}{2} \times 15 + 8 = 60\ m^2$

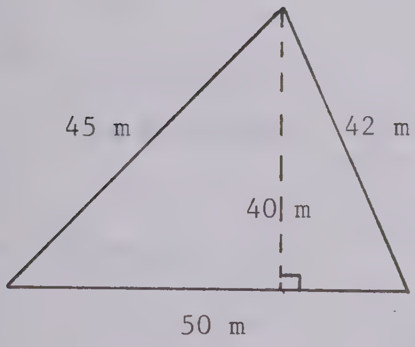












C $60m^2$	O 37m	B $42m^2$	T $14m^2$	A 105m	H 25m
M $375m^2$	I 14m	E $89m^2$	L 112m	D 39m	F $24m^2$
G 137m	E 75m	P $30m^2$	T $98m^2$	A 24m	T 103m
E 40m	R $240m^2$	L 30m	P $1000m^2$	E 87m	S $75m^2$

7.

WHY IS A TRAP LIKE THE MEASLES?

To find the answer to this riddle, work any problem and find your answer in the column on the right. The number of the answer tells you where to put the letter.

B. Area of a square with side 7 m

C. Perimeter of an isosceles triangle with base of 13 m and sides 19 m.

E. Perimeter of a trapezoid with side 6 m, 11 m, 4 m, 8 m

H. Area of a rectangle with dimesnions 17 m by 11 m

T. Area of an equilateral Δ with sides 15 m and height 12 m

A. Area of a parallelogram with base 35 m, height 20 m

C. Perimeter of a rectangle with length 3 m, width 0.5 m

T. Perimeter of a parallelogram with sides 16 m and 13 m

R. Perimeter of equilateral pentagon with sides 8 m

A. Area of a trapezoid with bases 9 m and 8 m and with height 4 m

O. Perimeter of an equilateral octagon with side 14 m

N. Perimeter of a rhombus with sides 12 m

H. Perimeter of a 7 m equilateral triangle

E. Area of a rhombus with sides 25 m and height 20 m

I. Area of a triangle with base 12 m and height 13 m

G. Perimeter of a 3 m square

T. Perimeter of a scalene Δ with sides 26 m, 24 m, and 10 m

Y Area of a rectangle with dimensions 16 m by 17 m

H. Area of a parallelogram with height 14 m and base 10 m

1. 90 sq m
2. 140 sq m
3. 29 m
4. 272 sq m
5. 700 sq m
6. 40 m
7. 500 m^2
8. 49 sq m
9. 112 m
10. 58 m
11. 21 m
12. 51 m
13. 34 m^2
14. 60 m
15. 7 m
16. 187 sq m
17. 78 m^2
18. 48 m
19. 12 m

___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

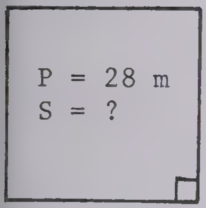
8. DAFFYNITION:

WHAT IS "PEOPLE TRANSPORTATION"?

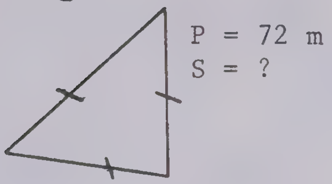
To solve the daffynition, (1) For each polygon find the missing dimension.

(2) Locate your answer in the boxes at the bottom and place the letter of the question in the box.

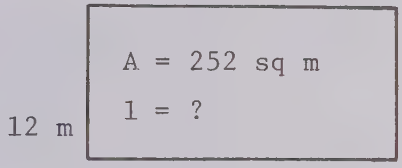
Ⓐ



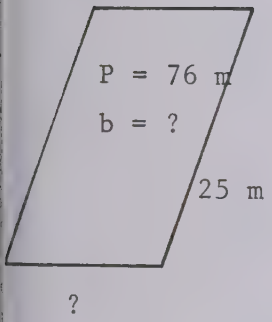
Ⓕ



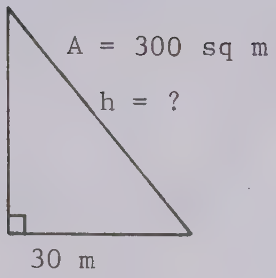
Ⓖ



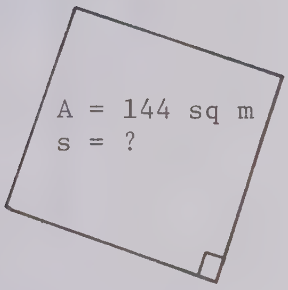
Ⓚ



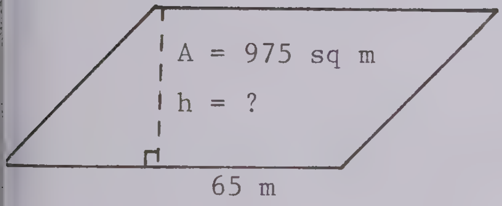
Ⓛ



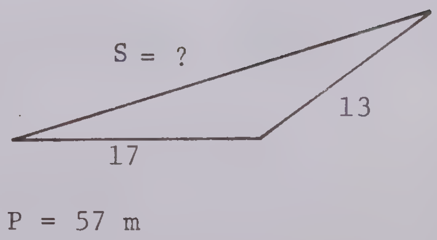
Ⓝ



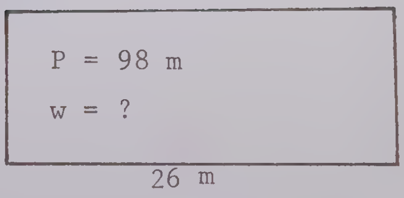
Ⓞ



Ⓢ



Ⓦ

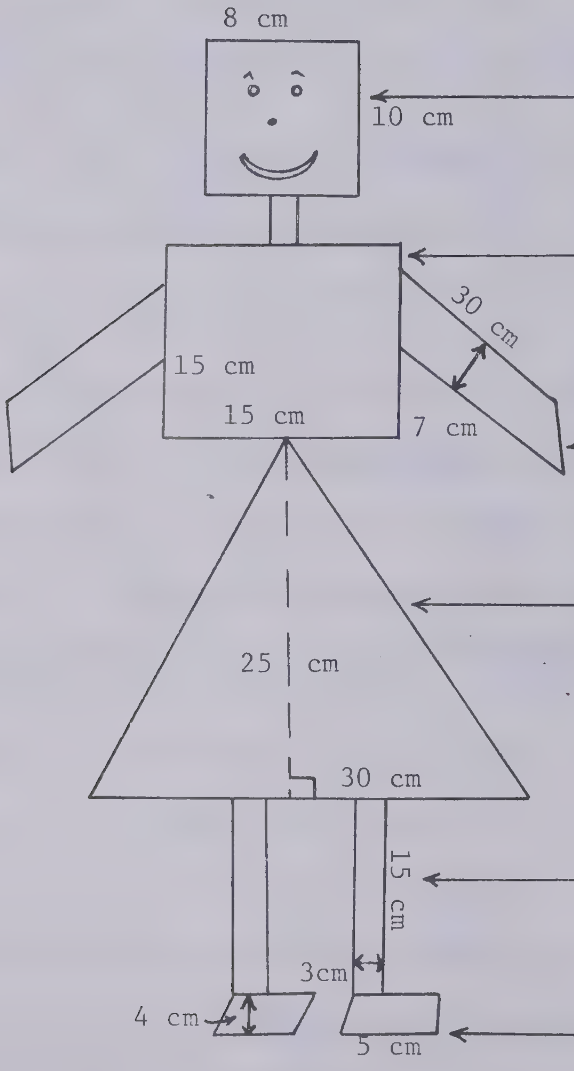


4 m   15 m   20 m   13 m   27 m   23 m   7 m   21 m   15 m   12 m

1.

Little Miss Metric

What is the area of this lady?



A = ____________

A = ____________

A = 2 x ____________

A = ____________

A = 2 x ____________

A = 2 x ____________

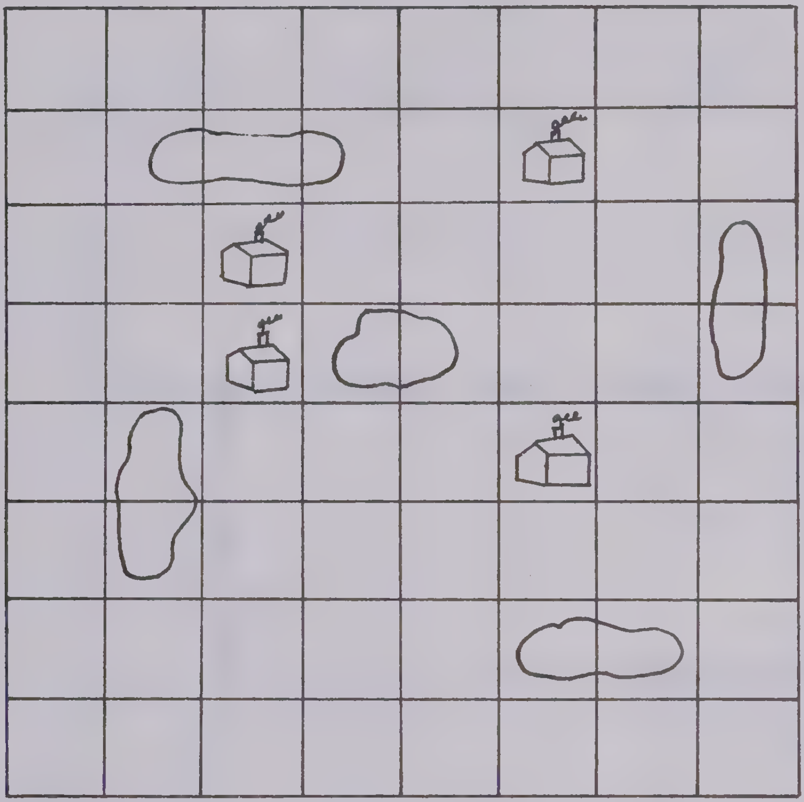
SUM = ____________

2. PUZZLERS:

Don't Fence Me In

You are to build a fence so that each lake is inside and each house is outside the fence. The fence must follow the grid lines and must be along the shortest path possible.

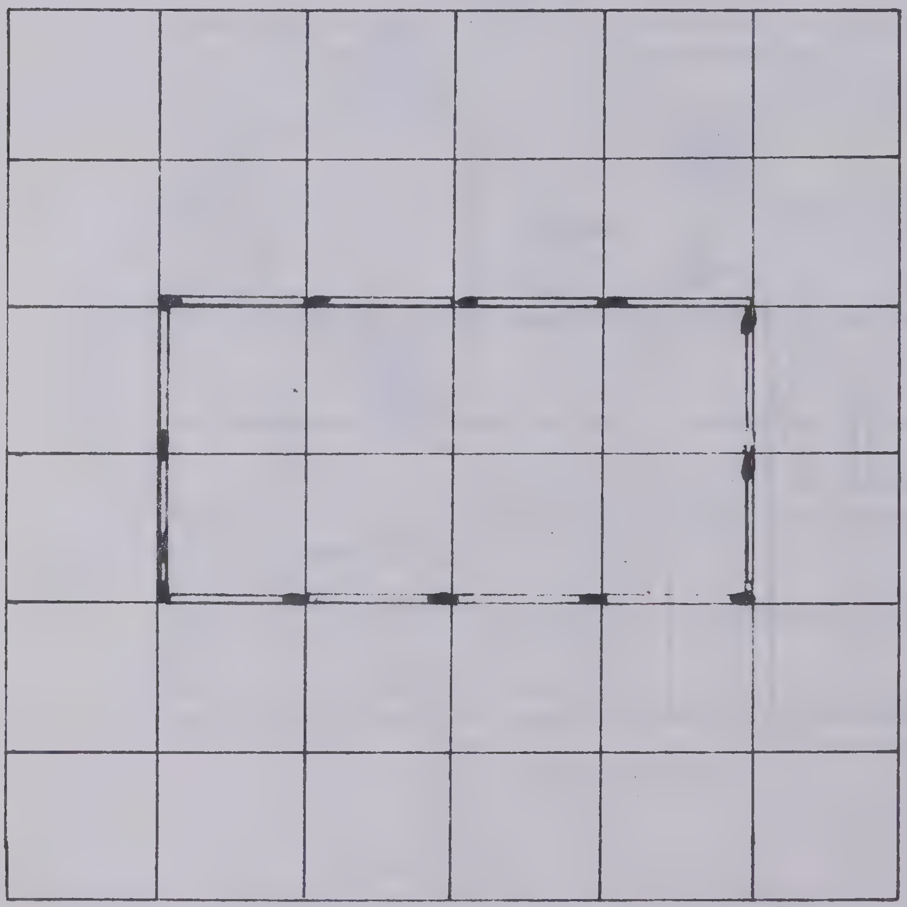
What would be the perimeter of the polygon thus formed?



3. PUZZLER

Twelve matchsticks laid out this way describe a polygon (rectangle) whose are is 8 square units.

How would you arrange the matchsticks so that the area of the polygon would be 9, 7, 6, and 5 square units?



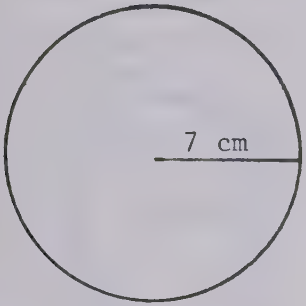
π is read as PI.

$\pi = \frac{22}{7}$ or 3.14

$C = 2\pi r$

1. Find the circumference of the following circles, using $\frac{22}{7}$ for π.

(a)



$C = 2\pi r$

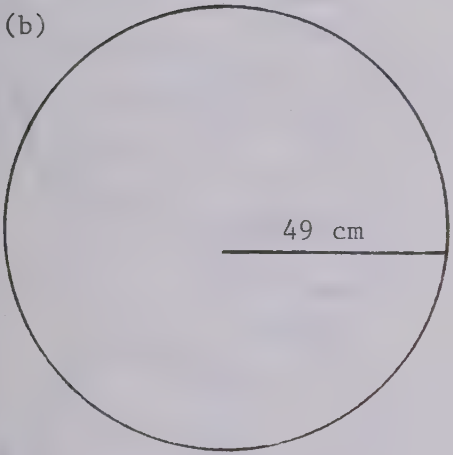
$2 \times \frac{22}{7} \times 7$

44 cm

π is the ratio of the circumference to the diameter of a circle.

$\pi = \frac{C}{d}$

(b)



C = ______

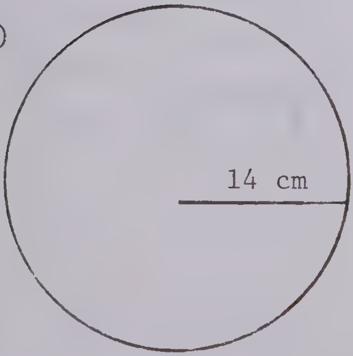
______

______

CIRCUMFERENCE is the distance around a circle.

DIAMETER is the distance across a circle

(c)



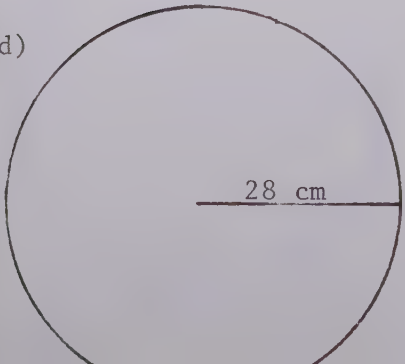
C = ______

______

______

RADIUS is the distance from the centre to the outside of a circle.

(d)



C = ______

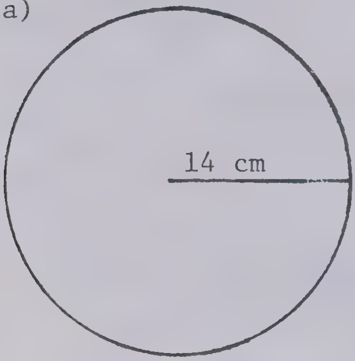
______

______

"C" stands for circumference and "r" stands for radius.

2. Find the circumference of the following circles using $\frac{22}{7}$ for π.

(a)



$C = \pi d$

$= \frac{22}{7} \times 14$

$= 44$ cm

"d" stands for diameter!

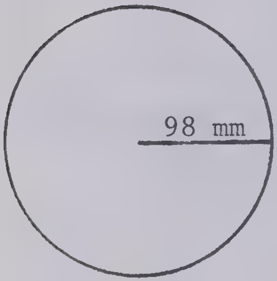
$C = 2\pi r$

or

$C = \pi d$

WHY???
Because $d = 2r$, that means 2 times the radius gives us the diameter.

(b)

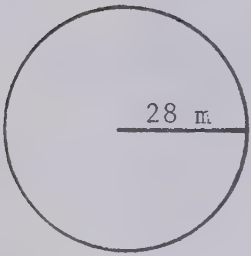


C = ____

= ____

= ____

(c)



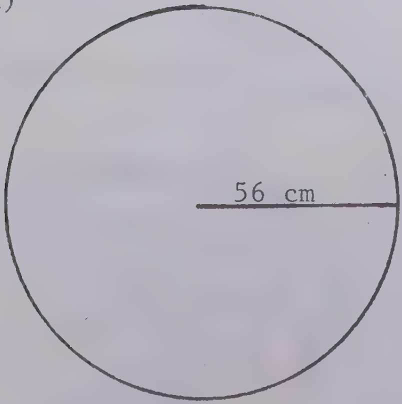
C = ____

= ____

= ____

$\frac{22}{7}$ is used for in these problems to make them easier to figure out!

(d)



C = ____

____

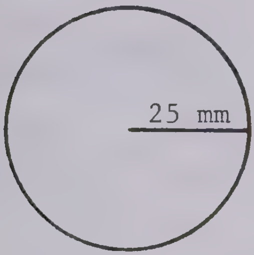
____

$\pi = \frac{22}{7}$ or 3.14

$\frac{22}{7}$ is used when diameter or radius are given as fractions or multiples of seven, otherwise we use 3.14 for π.

Find the circumference of the following circles using 3.14 for π.

(a)

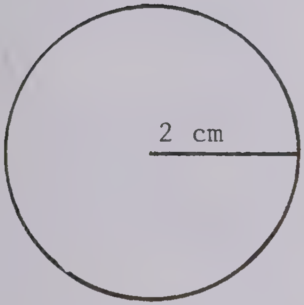


C = 2πr

2 x 3.14 x 25

157 mm

(b)

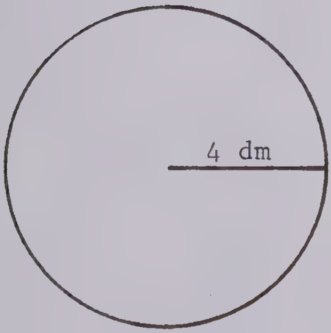


C = ______

______

______

(c)

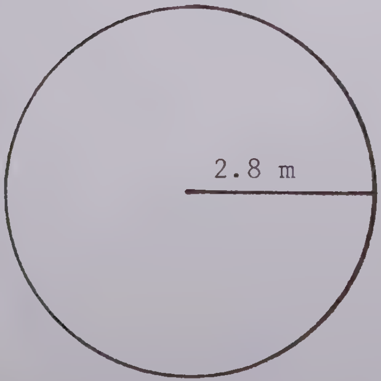


C = ______

______

______

(d)



C = ______

______

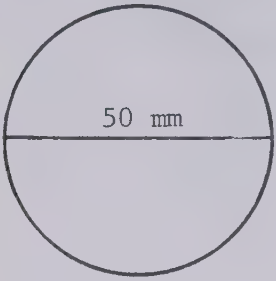
______

DON'T FORGET TO USE YOUR UNIT IN THE ANSWER!

Using 3.14 in these problems only makes them easier to figure out.

4. Find the circumference of the following circles using 3.14 for π.

(a)



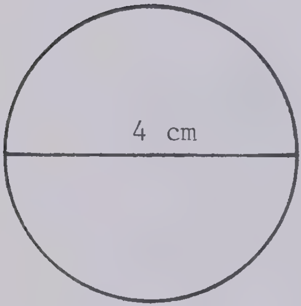
C = πd

3.14 x 50

157 mm

Circumference is found by multiplying π and the diameter of a circle.

(b)

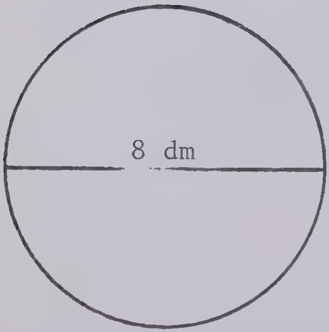


C = ____________

____

____

(c)

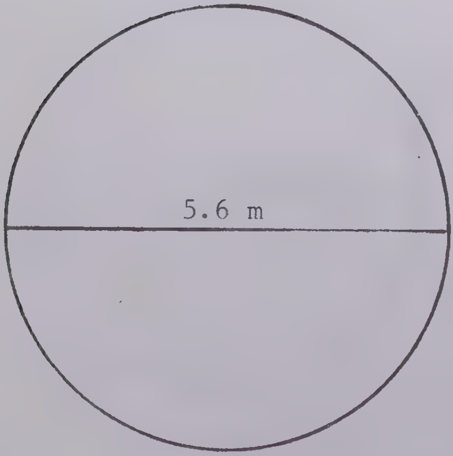


C = ____________

____

____

(d)



C = ____________

____

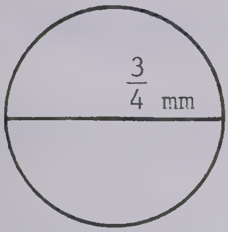
____

"FINDING THE CIRCUMFERENCE OF A CIRCLE IS AS EASY AS PI "

REMEMBER!!
$C = \pi d$ or $C = 2\pi r$

Find the circumference of the following. Use either $\frac{22}{7}$ or 3.14.

(a)

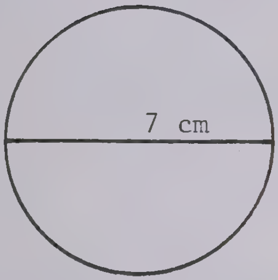


C = ________

____

____

(b)

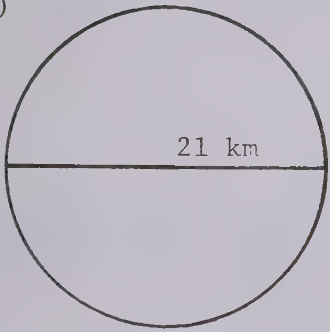


C = ________

____

____

(c)

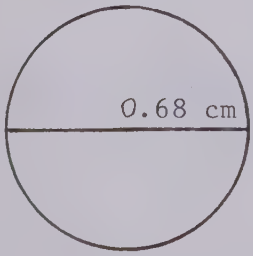


C = ________

____

____

(d)

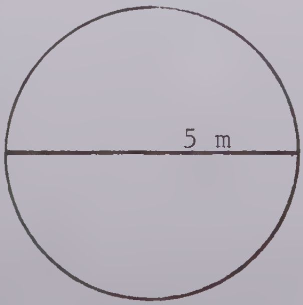


C = ________

____

____

(e)



C = ________

____

____

6. PROBLEM SOLVING: Show all necessary steps. Solve the following problems and find the answer to the following riddle:

"I went into the woodshed and picked up a peculiar object. When I looked for it I couldn't find it. Because I couldn't find it, I had to take it into the house. When I got into the house, I had a hard time getting it out. What was the object???? "

To decode the answer to the riddle match the letter of each problem with its answer in the code found at the end of the problems.

(L) A bicycle wheel has a radius of 12 cm. What is the circumference of the wheel?

(S) A Runaway Pancake rolled its way to adventure. If its diameter was 14 cm, how far did it go in one complete roll?

(I) The steering wheel of a race car has a radius of 20 cm. What is its circumference?

(R) A hoop is made by tying the ends of a 100 cm long piece of rope together. If 10 cm of rope are used in the knot, what is the radius of the hoop?

(N) A circular table top has a circumference of 314 cm. Find its diameter.

(P) A hula hoop has a circumference of 60 cm. What is its diameter?

(E) A metal hoop has a radius of 24 cm. Find its circumference?

(T) A toy train track is circular. The inside diameter is 80 cm and the track is 3 cm wide. How much farther must the outside wheels of the train travel than the inside wheel on one complete circuit?

___	___	___	___	___	___	___	___
cm	$19\frac{17}{157}$ cm	75.36 cm	125.6 cm	100 cm	18.84 cm	150.72 cm	14.33 cm

TO FIND THE CIRCUMFERENCE OF A CIRCLE? TAKE PI AND MULTIPLY IT TIMES THE DIAMETER OR TAKE TWO TIMES PI TIMES THE RADIUS.

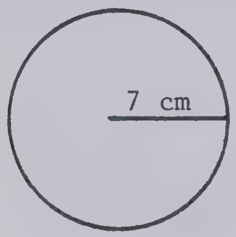
"A" stands for area, and it is always given in square units.

$A = \pi r^2$

To find the area of a circle, you multiply pi times the radius times the radius (radius squared).

7. Find the area of the following circles using $\frac{22}{7}$ for π.

(a)



$A = \pi r^2$

$= \frac{22}{7} \times 7^2$ or $\frac{22}{7} \times \frac{7}{1} \times \frac{7}{1}$

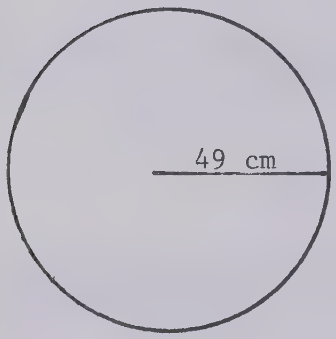
$= \frac{22}{7} \times 49$

154 cm^2

CAUTION

r^2 does not mean $2 \times r$

(b)



$A = \pi r^2$

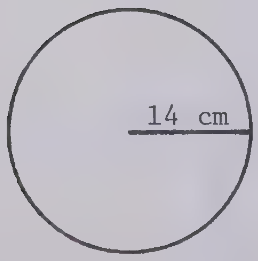
$\frac{22}{7} \times 49^2$ or $\frac{22}{7} \times \frac{49}{1} \times \frac{49}{1}$

______

______

r^2 means $r \times r$

(c)



A = ______

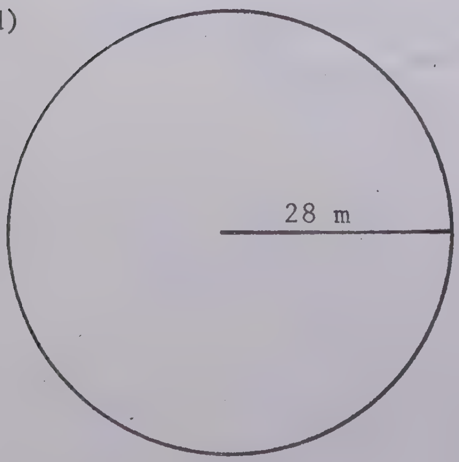
______

______

______

r stands for radius

(d)



A = ______

______

______

______

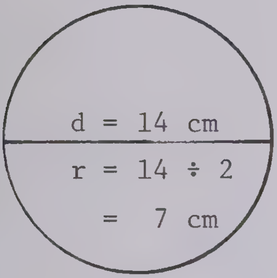
Since $d = 2r$, to find the radius when you are given the diameter, you just divide by two.

You must still use $A = \pi r^2$

AREA IS THE AMOUNT OF SURFACE COVERED.

Find the area of the following circles using $\frac{22}{7}$ for π.

(a)



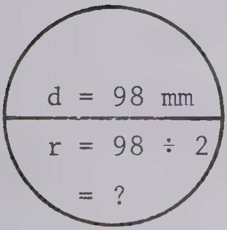
$A = \pi r^2$

$\frac{22}{7} \times 7^2$

$\frac{22}{7} \times 49$

154 cm^2

(b)



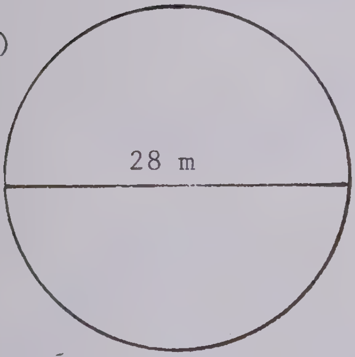
A = ____________

____

____

____

(c)



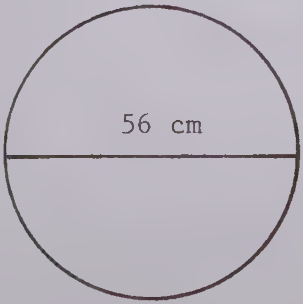
A = ____________

____

____

____

(d)



A = ____________

____

____

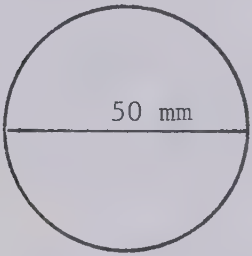
____

Only radius can be used for finding the area of a circle.

REMEMBER - when you are given the diameter divide it by two to get the radius.

10. Find the area of the following circles using 3.14 for π.

(a)



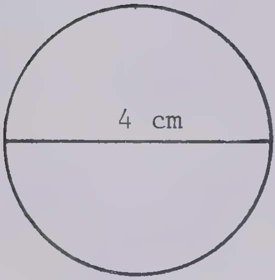
A = πr^2

3.14×25^2

3.14×625

$1962.5\ mm^2$

(b)



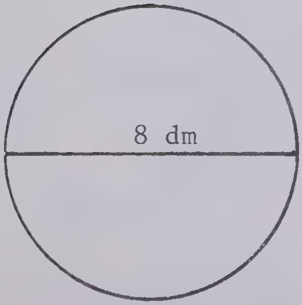
A = ____________

____

____

____

(c)



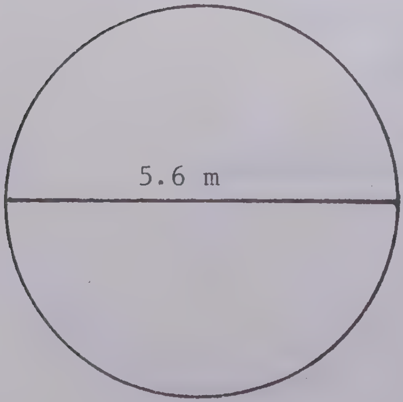
A = ____________

____

____

____

(d)



A = ____________

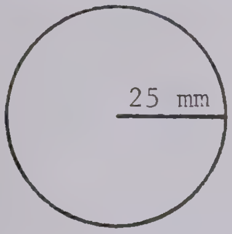
____

____

____

Find the area of the following circles using 3.14 for π.

(a)



A = πr^2

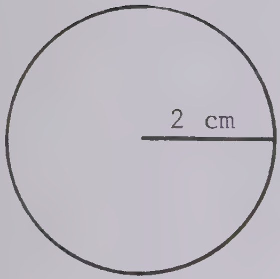
3.14×25^2

3.14×625

1962.5 cm^2

Remember area is given in square units.

(b)



A = ____________

____

____

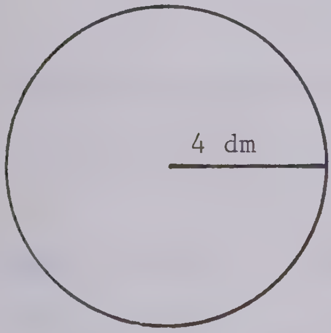
____

The rule for using 3.14 or $\frac{22}{7}$ for π is the same as the one we had for finding the circumference.

Do you recall the rule??

If you don't, look back and find out!

(c)



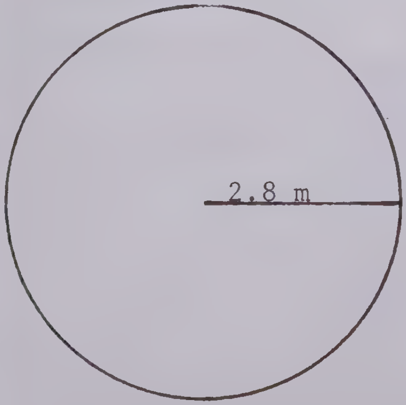
A = ____________

____

____

____

(d)



A = ____________

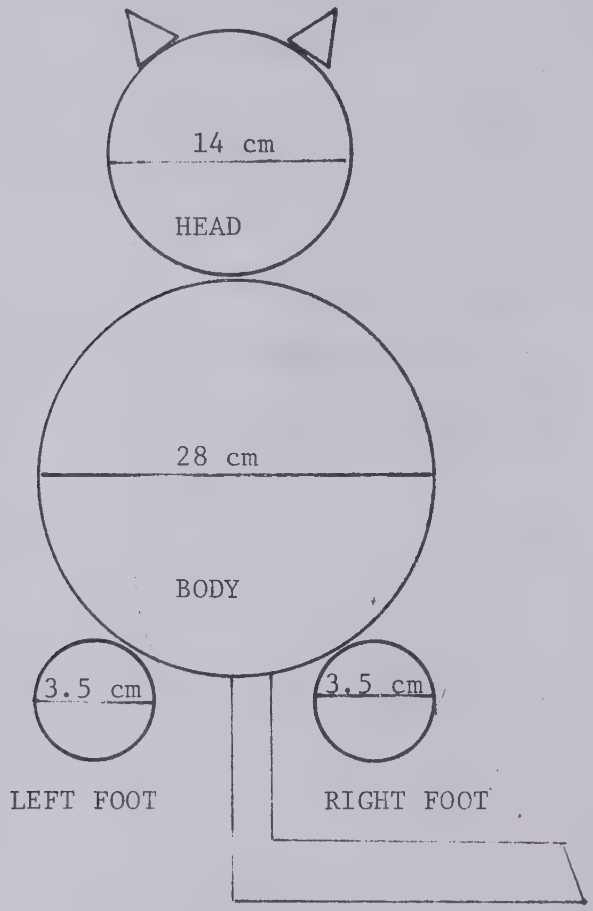
____

____

____

11. Find the area of the following, using either $\frac{22}{7}$ or 3.14 for π.

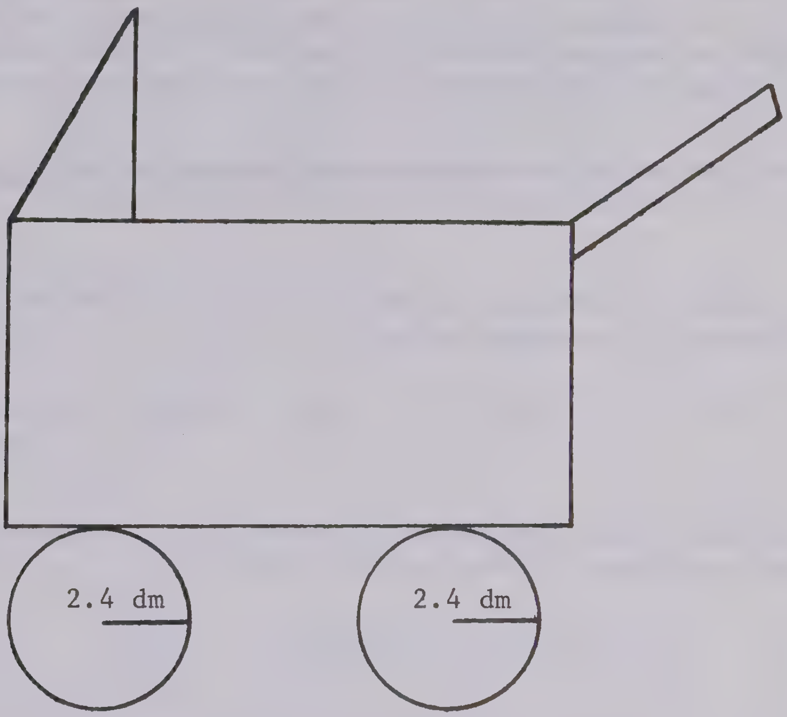
(a) Find the area of the circles that make up the cat.



Area of Head	+	Area of Body	+	Area of Left Foot	+	Area of Right Foot
πr^2	+	πr^2	+	πr^2	+	πr^2
$A = \frac{22}{7} \times \frac{7}{1} \times \frac{7}{1}$	+	$A = \frac{22}{7} \times \frac{14}{1} \times \frac{14}{1}$	+		+	
$A = 154\ cm^2$						
$154\ cm^2$						

TOTAL AREA = __________

11. (b) Find the area of the wheels of the baby buggy.



AREA OF THE LEFT WHEEL + AREA OF THE RIGHT WHEEL =

________________ ________________

________________ ________________

________________ ________________

________________ ________________ = ________________

FIDDLE DE DUM, FIDDLE DE DEE,
A RING AROUND THE MOON IS π TIMES d,
BUT IF A HOLE YOU WANT REPAIRED,
YOU USE THE FORMULA πr^2.

12. PROBLEM SOLVING: Show all necessary steps. Solve the following problems and find the answer to the following riddle:

"One day a turtle, a duck, and a skunk went to a candy store to buy some goodies. The storekeeper looked over the unusual trio and decided to let the turtle in because it had a green back. He also let the duck in because it had a bill, but he told the poor skunk to go away. Why??"

To decode the answer to the riddle match the word of each problem with its answer in the code found at the end of the problems.

(HAD) A circular swimming pool has a radius of 10 metres. What is the area of the swimming pool?

(SKUNK) A circular skating rink has an area of $201 \frac{1}{7}$ square metres. Find the radius of the skating rink.

(WAS) A flower garden has a diameter of 7.28 metres. Find the area of the garden.

(THE) A circular disc has a radius of 2.8 centimetres. What is the area of the disc?

(CENT) A circular table has an area of 7.065 square metres. Find the diameter of the table.

2.

(ALL) A circular watch has a radius of 2 centimetres. Find the area of the watch.

(POOR) Find the area of seven buttons each with a diameter of 2.2 cm.

(A) The radius of a circular window is 3 metres. Find the area of the window.

______ 12.56 cm^2 ______ 24.6 cm^2 ______ 26.5958 cm^2 ______ 8 m

______ 314 m^2 ______ 41.6 m^2 ______ 28.26 m^2 ______ 3 m

KEY TO EXERCISES

LEVEL 8

UNIT III

GEOMETRY

KEY TO EXERCISES

bjective No. 6

. (a) Yes (b) Yes (c) Yes (d) Yes

. (a) Yes (b) Yes (c) Yes (d) Yes (e) Yes

Cloud: Is FRED congruent to HANK? Yes
Is each part of FRED congruent to a part of HANK? Yes

. (a) EN (b) NR (c) RY (d) YH (e) HE

. I love congruence.

. Hank Aaron

. $\overline{WR}$, No. It forms a side of CROW.

bjective No. 8

. Montreal 2. Bobby Hull 3. Edmonton

. b 1.
c 2.
b 3.
a 4.
a 5.
c 6.
b 7.
c 8.
b 9.
a 10.

Key to Exercises

Objective No. 9

1. (a) right (b) obtuse (c) acute

2. Right triangle

3. Obtuse

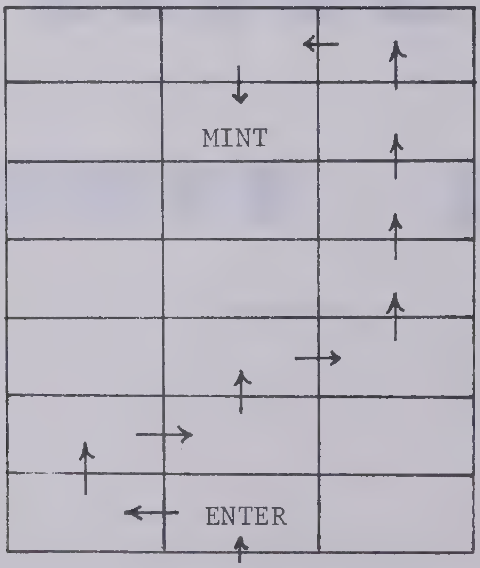
4. Right

5. (a) acute (b) obtuse (c) right

6. GE * OM * E * TRY (Gee, I'm a tree)

7. A man outstanding in his field.

8. A MAZE MINT:



9. (a) right
(b) right
(c) right
(d) right
(e) right
(f) right
(g) right
(h) right
(i) acute
(j) obtuse
(k) acute
(l) right
(m) acute

Objective No. 10

1. (a) isosceles (b) scalene (c) equilateral
   (d) scalene (e) scalene (f) isosceles

2. (a) isosceles (b) scalene (c) equilateral
   (d) isosceles (e) equilateral (f) scalene

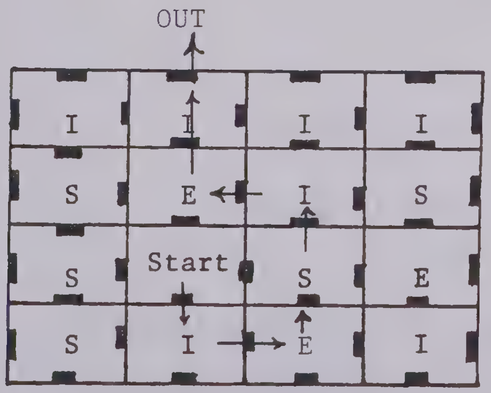
3. (a) equilateral (b) isosceles (c) scalene
   (d) isosceles (e) isosceles (f) scalene (g) equilateral

4. Daffynition: "Free Speech"

5. Watzit: "Floating Fatso Smoking a Pipe"

6. (a) isosceles (b) scalene (c) scalene (d) scalene
   (e) scalene (f) isosceles (g) isosceles (h) scalene
   (i) scalene (j) scalene (k) scalene (l) scalene
   (m) scalene (n) isosceles

7.



Objective No. 14

B. $\angle R = 35^\circ$

$\angle D = 43^\circ$

$\angle E = 75^\circ$

$\angle F = \underline{62^\circ}$

Total $=180^\circ$

1. (a) $\angle A = 69^\circ$

   (b) $\angle F = 82^\circ$

   (c) $\angle H = 65^\circ$

   (d) $\angle K = 90^\circ$

   $\angle J = 28^\circ$

   (e) $\angle M = 60^\circ$

   $\angle N = 60^\circ$

   $\angle O = 60^\circ$

   (f) $\angle Q = 64^\circ$

   $\angle R = 64^\circ$

   (g) $\angle X = 99^\circ$

   (h) $\angle T = 43^\circ$

   (i) $\angle W = 47^\circ$

2. A Dish Jockey

3. A Black-Eyed Susan

   (a) 28°

   (b) 55°

   (c) 33°

   (d) 59°

   (e) 50°

   (f) 113°

   (g) 27°

   (h) 60°

   (i) 73°

   (j) 62°

   (k) 10°

   (l) 39°

   (m) 17°

   (n) 148°

   (o) 47°

Objective No. 16

1. Phil Esposito

2. Bobby Clarke

3. Window Pane

4. (a) $\angle$ FOG

   (b) $\angle$EOG and HOI

   (c) $\angle$ EOF and $\angle$GOH

   (d) $\angle$ HOI

   (e) $\angle$GOH and IOJ

   (f) $\angle$LXM and $\angle$NXP

   (g) $\angle$ NXP

   (h) $\angle$MXN

   (i) $\angle$MXN and $\angle$PXR

5. Ketchup

Objective No. 16

6.

d	1.	b	6.
b	2.	e	7.
c	3.	c	8.
e	4.	d	9.
a	5.	a	10.

Objective No. 17

1. (a) E , W , T (b) T, F, W

2. Yes Are the corresponding angles always congruent? Yes
Yes
Yes
Yes

3. Yes Are the alternate angles always congruent? Yes
Yes
Yes
Yes

4.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
T	H	E	Y	A	R	E	T	W	O	T	I	R	E	D

5. (a) $\angle A = 60^\circ$
(b) $\angle B = 120^\circ$
(c) $\angle C = 60^\circ$
(d) $\angle D = 60^\circ$
(e) $\angle E = 120^\circ$
(f) $\angle F = 120^\circ$
(g) $\angle G = 60^\circ$

6. (a) $\angle 1 = 70^\circ$
(b) $\angle 2 = 110^\circ$
(c) $\angle 3 = 70^\circ$
(d) $\angle 4 = 70^\circ$
(e) $\angle 5 = 110^\circ$
(f) $\angle 6 = 70^\circ$
(g) $\angle 7 = 70^\circ$
(h) $\angle 8 = 110^\circ$
(i) $\angle 9 = 110^\circ$
(j) $\angle 10 = 70^\circ$

Objective No. 18

1. (a) 9 cm
(b) 14 cm
(c) 11 cm
(d) 18 cm
(e) 14 cm
(f) 12 cm

2. Any version of P = sum of the sides.

3. (a) 365 mm
(b) 35 cm
(c) 14 cm
(d) 182 mm

4. and 5. Answers will vary.

Objective No. 19

1. "Take away his credit cards."

2. "A safe robbery."

Objective No. 25

A. 1. (a) 41.5 mm
(b) 13 m
(c) 850 cm
(d) 43 m
(e) 22m
(f) mm
(g) 124 km
(h) 42.8 cm
(i) 11.7 m
(j) 89.3 cm

Objective No. 25

2. (a) 120 m (b) 12 km (c) 89.4 cm

3. (a) 120 mm (b) 85 m (c) 180 km

4. (a) 108 m (b) 17.5 cm (c) 216 m (d) 13.2 mm
(e) 36 km (f) 16.8 cm (g) 14.8 m (h) 75 m

5. (a) 91.7 cm (f) 12 m
(b) 26.8 m (g) 217.2 m
(c) 23.8 km (h) 32.5 cm
(d) 226 mm (i) 14.8 m
(e) 82.7 cm (j) 229 cm

B. 1. (a) 187 sq m (b) 40 000 sq cm (c) 2135 sq cm
(d) 49 000 sq mm (e) 37.8 sq m (f) 131 670 sq cm
(g) 225 sq cm (h) 468 sq mm

2. (a) 10.5 sq km (b) 3 000 sq cm (c) 130 sq m
(d) 3 sq m (e) 3 000 sq m

3. (a) 137.5 sq mm (b) 900 sq cm (c) 924.5 sq mm
(d) 11 375 sq mm (e) 10.26 sq m

REVIEW EXERCISES:

1. (a) 225 sq cm (b) 1.08 sq km (c) 169 sq m
(d) 660 sq mm (e) 34 686 sq cm (f) 2.55 sq m

2. A Free Pain: "Tease a watchdog."

3. Ele-fun-T-Area: "To Creep up on mice."

4. A Bunch of Nothing: "A vacant lot."

5. Daze of the Meterpede:

(a) P = 90 m
A = 360 sq m
(b) P = 46 m
A = 98 sq m
(c) P = 66 m
A = 240 sq m

(d) P = 44 m
A = 121 sq m
(e) P = 80 m
A = 400 sq m

Objective No. 25 - Review Exercises

6. A Penniless Problem: "The letter E"
7. Why is a Trap like the Measles? "They are both catching"
8. What is People Transportation? "Folks Wagon"

Acitivity

1. Little Miss Metric: $A = 80\ cm^2$

$A = 2 \times 210\ cm^2 = 420\ cm^2$

$A = 225\ cm^2$

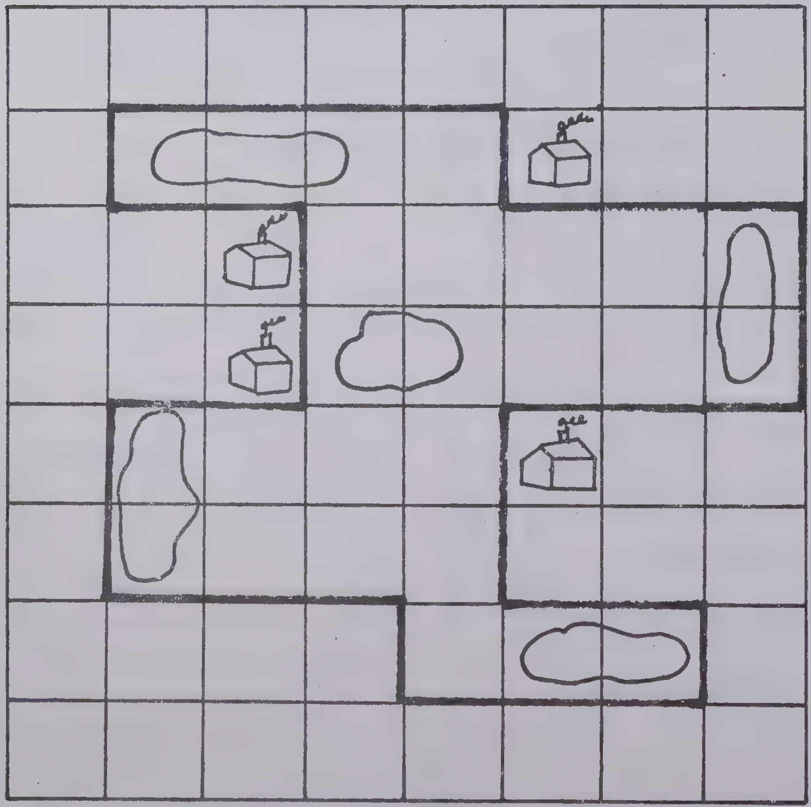
$A = 375\ cm^2$

$A = 2 \times 45\ cm^2 = 90\ cm^2$

$A = 2 \times 20\ cm^2 = 40\ cm^2$

Total Area = $1230\ cm^2$

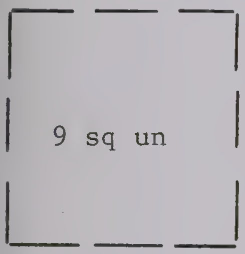
2. Don't Fence Me In:

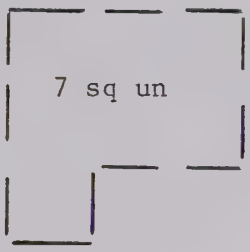


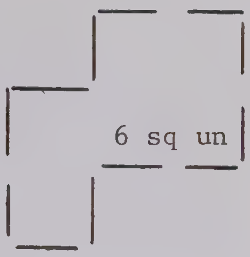
Perimeter = 34 units

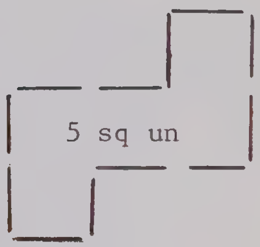
Activity

3. Matchsticks:









Objective No. 28

1. (b) 308 cm (c) 88 cm (d) 176 m

2. (b) 308 cm (c) 88 mm (d) 176 cm

3. (b) 12.56 cm (c) 25.12 dm (d) 17.584 m

4. (b) 12.56 cm (c) 25.12 dm (d) 17.584 m

5. (a) $4\frac{5}{7}$ mm (b) 44 cm (c) 65.94 km (d) 2.1354 cm (3) 15.7 m

6. "SPLINTER"

7. (b) 7546 cm^2 (c) 616 cm^2 (d) 2464 m^2

8. (b) 7546 mm^2 (c) 616 m^2 (d) 2464 cm^2

9. (b) 12.56 cm^2 (c) 50.24 dm^2 (d) 24.6176 m^2

10. (b) 12.56 cm^2 (c) 50.24 cm^2 (d) 24.6176 m^2

11. (a) 846.93 cm^2 (b) 36.1728 dm^2

12. "ALL THE POOR SKUNK HAD WAS A CENT"

RATIONAL NUMBERS

LEVEL 8

UNIT IV

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a. $A + x = B$
b. $Ax = B$
c. $Ax + B = C$
d. $\frac{x}{A} = \frac{B}{C}$
e. $Ax + Bx = C$
f. $A(x + b) = C$
*g. $Ax = Bx + C$
*h. $Ax + b = Cx + d$

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EXERCISES: UNIT IV OBJECTIVE NO. A-1

A. *Why do you open your eyes when you wake up?*

Follow these directions to obtain the answer:

1. Work each problem and find the correct answer in the rectangles below.
2. Shade out the letter or number above each correct answer. The hidden answer will remain.

(NOTE: Write quotients with remainders)

1. 6 354 + 7 693 =
2. 374 + 200 =
3. 56 + 77 + 39 =
4. 261 566 + 45 983 =
5. 99 - 76 =
6. 9 875 - 8 721 =
7. 783 - 298 =
8. 5 684 - 781 =
9. 7 983 x 567 =
10. 573 x 691 =
11. 26 x 54 =
12. 261 x 31 =
13. 2 394 ÷ 24 =
14. 1 074 ÷ 43 =
15. 59 832 ÷ 2 216 =
16. 870 ÷ 16 =
17. 216 + 321 - 415 =
18. 35 x 26 ÷ 7 =
19. 620 ÷ 10 ÷ 2 =
20. 2 341 - 162 - 457 =
21. 25 x 62 x 321 =
22. 121 ÷ 11 x 101 =

X	Y	Z	4	P	Q	U	A	D	E	G	M	7	S	2	9	Q	T	W
99 r 18	307 549	1 154	95 r 6	130	1 404	357 127	14 047	1 722	4 903	27	54 r 6	23	31	13	497 550	574	8 091	24 r 42

R	5	O	P	C	3	N
1 111	395 943	122	4 526 361	1 112	485	172

B. *What is the safest job in school?*

Directions:

Complete the following chain problems in order from left to right for each problem. Work any problem and find your answer in the coded message. Each time the answer appears in the code, write the letter at the end of that problem above it.

Take $\frac{3}{4}$ add $\frac{1}{3}$ subtract $\frac{1}{5}$ = $\frac{53}{60}$ = A

Take $\frac{2}{5}$ subtract $\frac{1}{6}$ multiply by $\frac{5}{7}$ = = S

Take $\frac{2}{9}$ divided by $\frac{2}{3}$ multiply by $\frac{2}{11}$ = = T

Take $\frac{3}{22}$ multiply by $\frac{11}{9}$ add $\frac{5}{12}$ = = B

Take $\frac{11}{12}$ subtract $\frac{2}{3}$ add $\frac{1}{9}$ = = G

Take $\frac{7}{10}$ add $\frac{3}{5}$ divided by $\frac{13}{20}$ = = H

Take $\frac{3}{5}$ subtract $\frac{3}{7}$ divided by $\frac{5}{7}$ = = N

Take $1\frac{1}{2}$ multiply by $3\frac{2}{3}$ subtract $1\frac{1}{2}$ = = L

Take $\frac{53}{8}$ multiply $\frac{4}{43}$ multiply $\frac{37}{8}$ = = K

Take $2\frac{1}{6}$ divide $\frac{2}{3}$ add $2\frac{1}{2}$ subtract $\frac{3}{4}$ = = E

Take $2\frac{2}{15}$ subtract $1\frac{2}{5}$ add $\frac{3}{10}$ multiply $\frac{60}{5}$ = = P

Take $6\frac{1}{6}$ divide $\frac{3}{12}$ multiply $\frac{5}{74}$ add $\frac{1}{3}$ subtract $\frac{2}{7}$ = = I

CAUTION!
Reduce
Answers

Remember when adding or subtracting you must have a common denominator.

When dividing, multiply by the reciprocal of the divisor.

When multiplying

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

								;		'	
$\frac{2}{33}$	2	$1\frac{5}{7}$	$\frac{6}{25}$	$1\frac{15}{16}$	$1\frac{5}{7}$	$\frac{6}{25}$	$\frac{13}{36}$		$1\frac{5}{7}$	$\frac{2}{33}$	$\frac{1}{6}$

	A							.
$12\frac{2}{5}$	$\frac{53}{60}$	$1\frac{5}{7}$	$\frac{6}{25}$	4	5	$\frac{1}{6}$	$\frac{1}{6}$	

C.

STUDENT:
Find the total cost to Bill Addright for servicing his car.

Name Bill Addright	Date 1 - 5 - 76	84972 Make Dodge Year 75
Address Box 1433	Phone 287-2562	Model Monaco
City or Town Payup, Alberta	Credit Card No. 261532187621	645-3237
Esso · Terms ☑ Cash ☐ Credit · Order by KW	Fill ☑ Esso. ☐ Esso Extra	Mileage 52 695

	INSTRUCTIONS	AMOUNT	
	Oil Change ☑ Type Esso Extra Filter ☑		
	Lubrication ☑	2	25
	Safety Inspection ☑	1	00
	Clean and pack front wheel bearings	2	80
	Balance wheels 1.60 each	6	40
	Wash and wax	5	00
	Wheel alignment	16	50
	Miscellaneous Shop Supplies	0	75
	TOTAL LABOUR	28	00
	TAX	0	00
	OUTSIDE REPAIRS	0	00
	TOTAL PARTS	22	96
	TECHNICIAN: AKW · PLEASE PAY THIS AMOUNT		

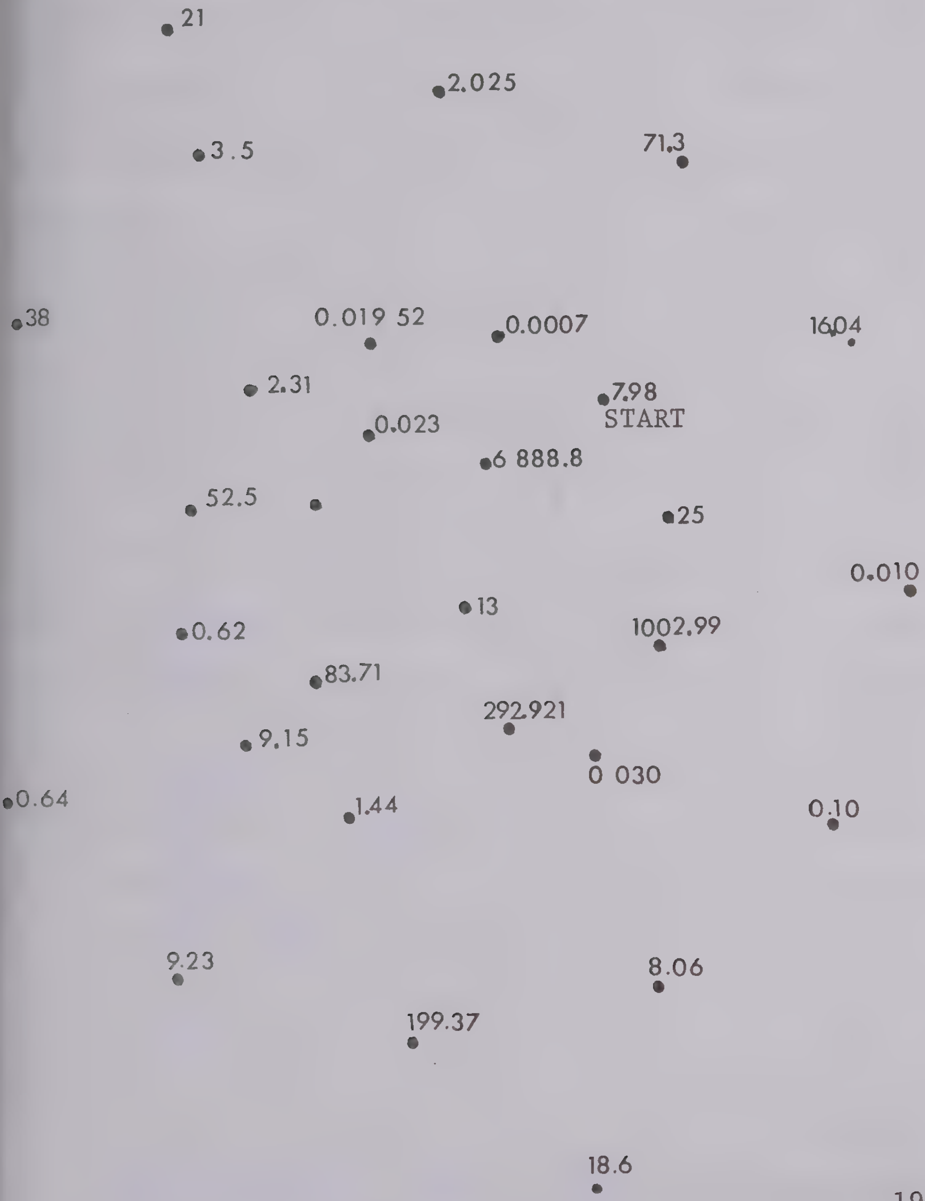
QTY	STOCK NO.	PARTS	AMOUNT	
1	6221	Filter	3	26
6ℓ	735	Oil @ $1.10	6	60
1	82386	Air Cleaner	3	85
1	21326	Carb. Kit	9	25
		TOTAL PARTS	22	96

D.

Earn a Star

Directions:

Work the problems and find the correct answers on the dots. Connect the dots in the same order as the problems are numbered. You may pass through the same dot more than once.



1. 2.68 + 5.3 = _____
2. 31.73 - 15.69 = _____
3. 6.25 ÷ 0.25 = _____
4. 0.24 x 6 = _____
5. 4.3 + 4.7 + 0.23 = _____
6. 16.2 - 7.05 = _____
7. 0.225 ÷ 1.5 = _____
8. 0.032 x 0.61 = _____
9. 0.025 + 2 = _____
10. 0.0023-0.0016=_____
11. 0.900 ÷ 30 = _____
12. 2.6 x 3.1 = _____
13. 35.7 + 16.8 = _____
14. 55.62-17.62=_____
15. 8.316 ÷ 3.6 = _____
16. 0.01 x 1.0 = _____
17. 981.3 + 21.69=_____
18. 0.68 - 0.04=_____
19. 0.01736 ÷ 0.028 = _____
20. 2.3 x 31 = _____
21. 74.321 + 218.6 = _____
22. 200 - 0.63 = _____
23. 87.5 ÷ 25 = _____
24. 0.2 x 0.5 = _____
25. 83 + 0.71 = _____
26. 81 - 17 = _____
27. 0.0943 ÷ 4.1 = _____
28. 21.8 x 316 = _____

E. 1. Complete your following TIME SHEET. (Fill in each rectangle.) You receive $2.50 per hour for regular hours and $3.75 for overtime (amount over 8 hours per day) on Saturday you work ½ a day. Your overtime starts after 4 hours of work. (*-denotes Saturdays)

Date	Total Hours	Regular Hrs. $2.50	Overtime Hrs. $3.75	Amt. for Reg. Hrs.	Amt. for Overtime	Total
May 2/75	11	8	3	$20.00	$11.25	$31.25
*May 3/75	4.5		0.5	10.00		
May 5/75	8	8	0			
May 6/75		8	2.75			
May 7/75		8			7.50	
May 8/75				20.00		23.75
May 9/75		6	0			
*May 10/75	4		0			
May 12/75	9					
May 13/75			2.5			
May 14/75			2			27.50
May 15/75	8					
May 16/75			2			
*May 17/75	5					
			Totals			

Total for Regular hours ______

Total for Overtime ______

Gross earnings ______

SPECIAL CHALLENGE 2. At noon May 17th, you received your pay cheque. Calculate how much money you will receive.

Gross Earnings from time sheet ________

less C.P.P. = 0.051 x Gross Earnings = ________ ________

U.E.I. = 0.012 x Gross Earnings = ________

Income tax = Gross Earnings ÷ 5 = ________

Compensation = Gross Earnings ÷ 150 = ________ ________

Sub Total ________ Net Earnings

F. Beside each problem in Column A write the expression from Column B that would show a different way of writing what is in Column A.

Column A	Column B
1. $\frac{2}{3} + \frac{3}{5} =$ ____________	25×0
2. $17 \times 22 =$ ____________	$(19 + 1) + 12$
3. $9 \times (10 \times \frac{2}{3}) =$ ____________	$17(20 + 2)$
4. $19 + (12 + 1) =$ ____________	1
5. $(16 + 7) \times 0 =$ ____________	10×9
6. $\frac{2}{3} + 0 =$ ____________	$\frac{3}{5} + \frac{2}{3}$
7. $\frac{19}{23} \times \frac{23}{19} =$ ____________	8×200
8. $15 \times (7 \times 4) =$ ____________	$\frac{2}{3}$
9. $2 + (3 + 8) =$ ____________	$(2 + 3) + 8$
10. $26.3 \times 1 =$ ____________	26.3
11. $9(5 + 7) =$ ____________	0
12. $200 \times 8 =$ ____________	$(9 \times 10) \times \frac{2}{3}$
13. $0 =$ ____________	$(15 \times 4) \times 7$
14. $5 \times 32 = 5 \times ($ ________ $)$	$9 \times 7 + 9 \times 5$
15. $5 \times 9 \times 2 =$ ____________	$(30 + 2)$

EXERCISES: UNIT IV OBJECTIVE NO. A-5

A. Complete the following by putting the correct answer in the $\square$.

1. $^{+}7 \times \boxed{0} = 0$
2. $^{-}3 \times 0 = \square$
3. $0 \times {}^{+}10 = \square$
4. $\square \times {}^{-}15 = 0$
5. $^{+}3 \times \square = 0$

Remember, zero times any integer is always zero

$^{+}8 \times 0 = 0$

B. Complete the following by putting the correct answer in the $\square$.

1. $^{+}7 + 0 =$
2. $\square + 0 = 0$
3. $\square + {}^{-}8 = {}^{-}8$
4. $^{-}13 + \square = {}^{-}13$
5. $^{+}16 + 0 = \square$
6. $1 \times {}^{-}6 = \square$
7. $\square \times 1 = {}^{+}8$
8. $^{-}17 \times \square = {}^{-}17$
9. $^{+}1 \times 0 = \square$
10. $^{+}25 \times 1 = \square$

Zero plus any integer is always that integer

$0 + {}^{+}6 = {}^{+}6$

Remember, one times any integer is that integer

$^{+}10 \times 1 = {}^{+}10$

HOWEVER,

One times any integer is that integer unless the integer is zero in which case the answer is zero

$1 \times 0 = 0$

C. Calculate the answers and state the number of the properties used.

1. $^{+}6$ x 0 = 0 3
2. $^{-}15$ x 1 = _____ _____
3. $^{+}6$ + 0 = _____ _____
4. ($^{-}3$x1) x 0 = 0 2 and 3
5. ($^{+}6$+0) x 1 = _____ _____
6. (0 x $^{+}5$) x 0 = _____ _____
7. (1 x $^{+}4$) x 1 = _____ _____
8. ($^{+}25$ x 1) x 0 = _____ _____
9. ($^{+}7$ + 0) + 0 = _____ _____
10. $^{-}15$ x 1 = _____ _____
11. 0 x $^{+}13$ = _____ _____
12. [(0 + 18) x 1] x 0 = _____ _____

PROPERTIES:

1. *Identity element property for addition.*
2. *Identity element property for multiplication.*
3. *Zero property.*

D. *Solution to Pollution*

Solve the following problems and decode the message below. Each time the answer appears in the code, write the letter of the problem above the answer in the code.

A $^{+}6$ x 0 =

B $^{-}9$ x 1 =

C 0 + $^{+}11$ =

E $^{-}6$ x 1 =

F 0 + $^{+}8$ =

G 0 + $^{-}3$ =

H $^{+}10$ x 1 =

I $^{-}15$ x 1 =

J 1 x $^{+}12$ =

L $^{+}16$ + 0 =

M $^{-}4$ x 1 =

N $^{+}20$ + 0 =

O $^{-}21$ x 1 =

R 0 + $^{+}22$ =

S $^{+}6$ x 1 =

T $^{-}7$ + 0 =

U 1 x $^{-}14$ =

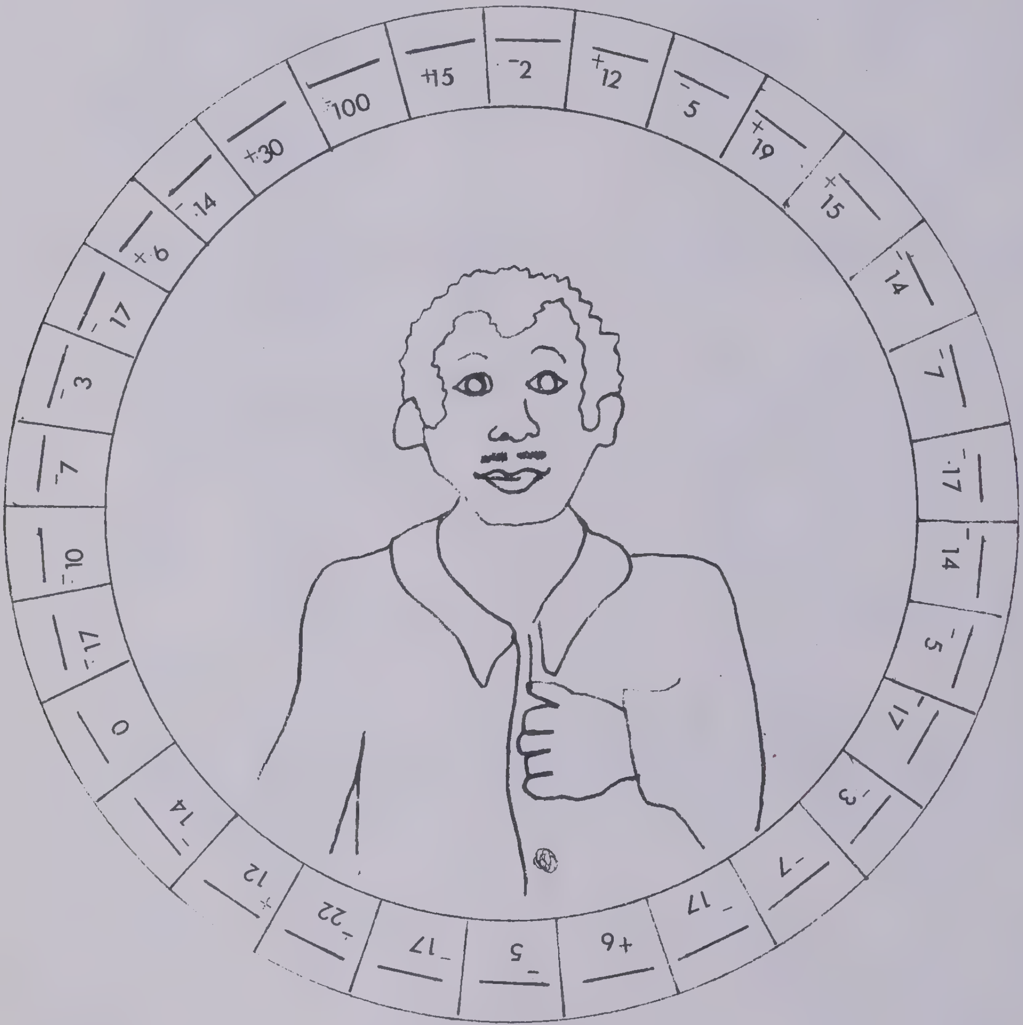
-4 0 -7 +10 -15 +6

0 +11 +16 -6 0 +20 +6 -14 -9 +12 -6 +11 -7 . -15 -7

5 +6 +6 -4 -21 -3 +8 +22 -6 -6.

A. *Math Button Message*

1. Determine the additive inverse for each of the integers given.
2. Each time your answer appears on the button, write the letter of the problem above it.



H $^{-}6$ _____

I $^{+}10$ _____

L $^{+}2$ _____

M $^{+}3$ _____

N 0 _____

O $^{-}100$ _____

R $^{-}15$ _____

S $^{+}5$ _____

T $^{+}17$ _____

U $^{+}22$ _____

W $^{-}30$ _____

A $^{+}7$ _____

D $^{-}12$ _____

E $^{+}14$ _____

G $^{-}19$ _____

B. State the additive inverse for each of the following.

1. $^{-}6$ ____
2. $^{+}15$ ____
3. $^{-}21$ ____
4. $^{+}33$ ____
5. $-(^{-}5)$ ____

HINT: The additive inverse of an integer always has the opposite sign. $^{+}6$ has an additive inverse of $^{-}6$.

C. An integer plus its additive inverse is always equal to the identity element zero.

$$\overset{\text{an integer}}{\overset{\downarrow}{^{+}10}} \;\underset{\underset{\text{plus}}{\nearrow}}{+}\; \overset{\text{its additive inverse}}{\overset{\downarrow}{^{-}10}} \;\underset{\underset{\text{is equal to}}{\uparrow}}{=}\; \overset{\text{identity element for addition. zero}}{\overset{\downarrow}{0}}$$

Remember:

Zero is its own additive inverse.

Complete the following questions.

1. $^{+}6 + ^{-}6 = \underline{\;0\;}$
2. $^{-}5 +$ ____ $= 0$
3. $^{+}3 + ^{-}3 =$ ____
4. ____ $+ ^{-}15 = \underline{\;0\;}$
5. ____ $+ 0 = 0$
6. $(^{+}6 + ^{-}6) + 0 =$ ____
7. $^{+}5 + ^{-}5 + 6 +$ ____ $= 0$
8. $^{-}12 + ^{+}2 + ^{-}2 =$ ____
9. ____ $+ (^{-}3 + ^{+}3) = \underline{\;^{-}17\;}$
10. $^{+}7 + ^{-}10 + ^{-}7 + ^{+}10 =$ ____

A.

BLUE RIDGE JUNIOR HIGH CONCESSION STORE

Month: November

Day	Item	Debit	Credit	Balance
	Balance from previous month			200.00
6	Weekly sales (noon)		60.00	
9	Nalleys	43.00		
11	Neilson's Chocolate	85.00		
13	Weekly sales (noon)		70.00	
16	St.Paul Beverages	80.00		
17	Old Dutch	55.00		
18	Basketball Tournament		150.00	
23	Horne & Pitfield	75.00		
24	St.Paul Cooperative	90.00		
27	Weekly sales (noon)		50.00	
30	Vansteeker Distributing	30.00		
30	Art Club Sales Meet		120.00	
	Totals for this month	______	______	______

1. Which column could be represented by positive integers? (debit, credit)
2. Which column could be represented by negative integers? (debit, credit)
3. Is the number in the balance column a positive or negative integer?
4. Write the first four transactions using positive or negative integers.
5. What is the sum total debit for the month of November?
6. What is the sum total credit for the month of November?
7. List the sum total of all the transactions using positive and negative integers.
8. Fill in the spaces in the balance column for each of the days listed.

B. Find the title of the picture at the bottom of the page.

1. Calculate the answers to the questions.
2. Place the code letter for that question in the blank corresponding to the correct answer.

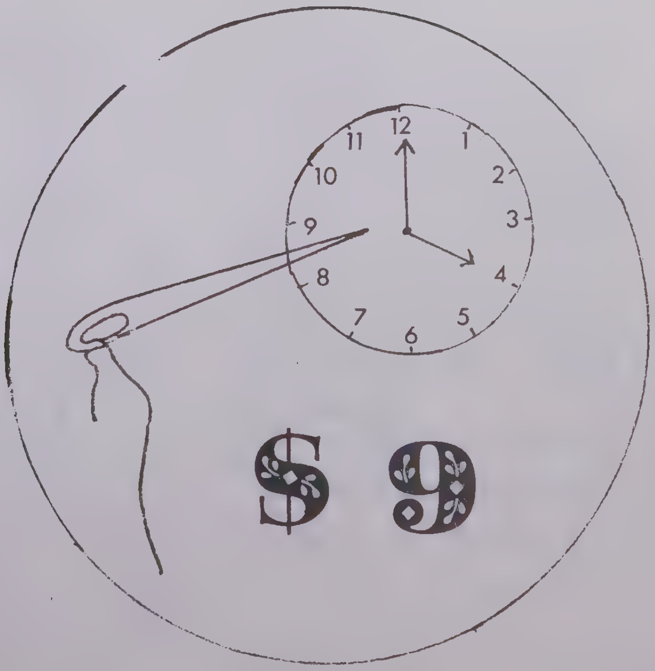
S $^{+}6 + {}^{+}2 =$
T $^{+}8 + {}^{-}2 =$
N $^{+}7 + {}^{+}7 =$
S $^{+}4 + {}^{-}11 =$
T $^{-}7 + {}^{-}5 =$
E $^{+}5 + {}^{-}6 =$
V $^{+}6 + {}^{-}1 =$
S $^{+}8 + {}^{+}1 =$
N $^{+}9 + {}^{-}12 =$
E $^{+}15 + {}^{-}8 =$
T $^{-}13 - {}^{-}6 =$

I $^{-}7 + {}^{-}8 =$
C $^{-}9 + {}^{+}10 =$
A $^{-}13 + {}^{-}26 =$
H $^{-}15 + {}^{+}4 =$
I $^{+}12 + {}^{+}13 =$
M $^{+}6 + {}^{-}11 =$
E $^{+}7 + {}^{-}13 =$
I $^{-}12 + {}^{-}8 =$
N $^{+}11 + {}^{-}7 =$
I $^{+}9 + {}^{-}13 =$
A $^{-}6 + {}^{-}3 =$

____   ____ ____ ____ ____ ____ ____   ____ ____   ____ ____ ____ ____
-9   +9 -19 -4 +6 +1 -11   -20 +14   -12 +25 -5 -6

____ ____ ____ ____ ____   ____ ____ ____ ____
+8 -39 +5 -1 -7   -3 -15 +4 +7

*C. Try and make an exercise of your own like the one you have just completed in part B.



D. *What is the difference between a tailor and a kiss?*

The answer to this important question is written in code at the bottom of the page. To Decode: First, work any problem below. Then find your answer in the code. Each time the answer appears in the code, write the letter of that problem above it. Keep doing problems until you have discovered the answer to the question.

H	$^{+}2 + {}^{+}3 =$	C	$^{-}14 + {}^{-}6 =$	K	$^{+}8 + {}^{+}2 =$
D	$^{+}10 + {}^{-}6 =$	R	$^{-}88 + {}^{+}47 =$	M	$^{+}59 + {}^{-}85 =$
L	$^{+}12 + {}^{+}3 =$	W	$^{-}3 + {}^{-}4 + {}^{-}5 =$	N	$^{-}7 + {}^{-}8 =$
A	$^{-}15 + {}^{+}6 =$	T	$^{-}180 + {}^{+}220 =$	E	$^{+}62 + {}^{-}43 =$
O	$^{+}2 + {}^{+}3 + {}^{-}4 =$	I	$0 + {}^{-}24 =$	S	$^{+}6 + 0 + {}^{-}7 =$

+40 +5 +19   +40 -9 -24 +15 +1 -41   -1 +19 -12 -1

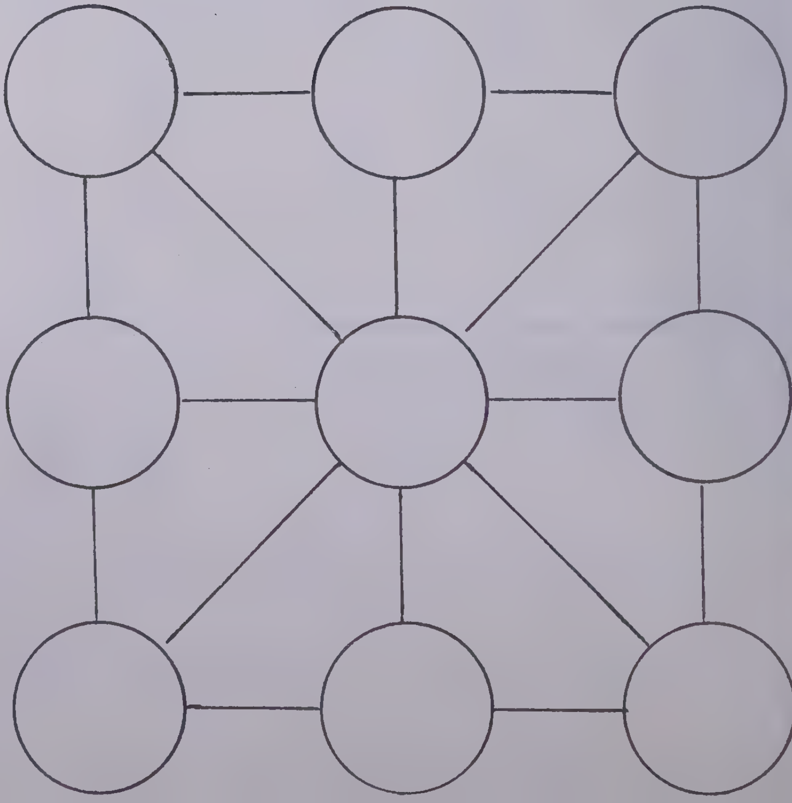
-15 -24 -20 +19   -1 +19 -9 -26 -1   -9 -15 +4

+40 +5 +19   +10 -24 -1 -1   -1 +19 +19 -26 -1

-1 +1   -15 -24 -20 +19

E. Listed below are nine integers: -4, -3, -2, -1, +1, +2, +3, +4, 0.

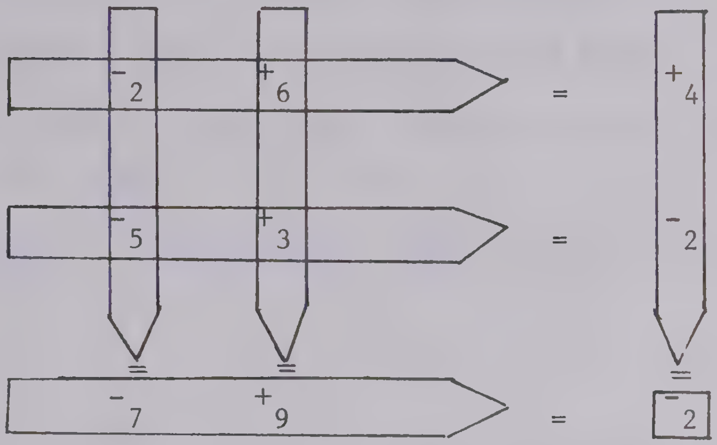
Arrange them in the circles on the right so that the total of each row in any direction of three circles is 0.



HINT:

The zero should be placed in the centre circle.

F.



DIRECTIONS: (See the above example)

add the numbers across the page.

$^{-}2 + {}^{+}6 = {}^{+}4$
$^{-}5 + {}^{+}3 = {}^{-}2$
$^{-}7 + {}^{+}9 = {}^{+}2$

Notice that you obtain the same answer across AND down.

add the numbers down the page.

$^{-}2 + {}^{-}5 = {}^{-}7$
$^{+}6 + {}^{+}3 = {}^{+}9$
$^{+}4 + {}^{-}2 = {}^{+}2$

1.

$^{+}5$	$^{+}8$	
$^{+}6$	$^{+}9$	
$^{+}11$		$^{+}28$

2.

$^{-}3$	$^{+}4$	
$^{-}7$	$^{+}9$	

3.

	$^{+}3$	$^{-}7$
	$^{-}5$	$^{+}4$

4.

	0	
$^{+}6$	0	
		0

5.

$^{+}6$		$^{-}4$
$^{-}2$		0

6.

$^{+}3$		$^{+}12$	
$^{-}7$	$^{-}9$		$^{+}1$
	$^{-}6$		$^{-}13$
$^{-}5$	$^{+}4$		

7. Make up an addition square of your own.

G. Let the students get into groups of 2 to 4 people. Give each group a pair of dice in which one is white and one is red. The white die will represent positive integers and the red die will represent negative integers. For example, if the dice were thrown and the white one showed five and the red 2, then the expression would be ${}^{+}5 + {}^{-}2 = {}^{+}3$.

RULES

1. Any one may start. First player rolls the dice. On his score sheet he must write an expression which represents his roll of dice. Then he writes the sum and finally the total as the game goes on.
2. If a player makes a mistake in the sum of his dice, he must start over from 0.
3. The first player to reach ${}^{+}25$ or ${}^{-}25$ is the winner.

SCORE SHEET

Toss	Expression	Sum	Total
1	${}^{-}6 + {}^{+}3$	-3	-3
2	${}^{+}5 + {}^{-}4$	+ 1	${}^{-}2$

(This game could be broadened by playing with more dice. e.g. 2 red and 2 white.)

H.

ADDINGO

1. Have the students draw a square and divide it into 9 equal squares.

2. Have the students choose 9 integers between ${}^{-}25$ and ${}^{+}25$ and place one integer in each square.

3. Using the 51 flash cards, flash the cards one at a time to the students. The students will work the problem and if they have the proper answer in one of the 9 squares, they will cross it out or cover it. The first student to get an X, L, Blackout, etc. wins. Prizes could be used for extra incentive.

Flash card problems. (problems could be varied to suit the level of students) NOTE: DO NOT PUT ANSWERS ON FLASH CARDS.

${}^{+}100 + {}^{-}125 = {}^{-}25$

${}^{-}2 + {}^{-}22 = {}^{-}24$

${}^{-}30 + {}^{+}7 = {}^{-}23$

${}^{-}16 + {}^{-}6 = {}^{-}22$

${}^{-}10 + {}^{-}11 = {}^{-}21$

${}^{+}5 + {}^{-}25 = {}^{-}20$

${}^{+}26 + {}^{-}44 = {}^{-}18$

${}^{-}8 + {}^{-}10 + {}^{+}1 = {}^{-}17$

${}^{-}9 + {}^{-}7 = {}^{-}16$

${}^{-}15 + 0 = {}^{-}15$

${}^{-}13 + {}^{-}1 = {}^{-}14$

$0 + {}^{-}13 = {}^{-}13$

${}^{-}5 + {}^{-}7 = {}^{-}12$

${}^{-}3 + {}^{-}8 = {}^{-}11$

${}^{-}5 + {}^{-}5 = {}^{-}10$

${}^{-}25 + {}^{+}16 = 9$

${}^{+}20 + {}^{-}12 = {}^{-}8$

${}^{-}52 + {}^{+}45 = {}^{-}7$

${}^{+}46 + {}^{-}52 = {}^{-}6$

${}^{-}33 + {}^{+}28 = {}^{-}5$

${}^{-}106 + {}^{+}102 = {}^{-}4$

${}^{+}152 + {}^{-}155 = {}^{-}3$

${}^{-}1 + {}^{-}1 = {}^{-}2$

${}^{+}5 + {}^{-}6 = 1$

${}^{-}5 + {}^{+}5 = 0$

${}^{+}6 + {}^{-}5 = {}^{+}1$

${}^{-}8 + {}^{+}10 = {}^{+}2$

${}^{-}200 + {}^{+}203 = {}^{+}3$

${}^{+}150 + {}^{-}146 = {}^{+}4$

${}^{+}95 + {}^{-}90 = {}^{+}5$

${}^{-}64 + {}^{+}70 = {}^{+}6$

${}^{-}10 + {}^{+}17 = {}^{+}7$

${}^{+}5 + {}^{+}3 = {}^{+}8$

${}^{+}27 + {}^{-}18 = {}^{+}9$

${}^{+}6 + {}^{+}4 = {}^{+}10$

${}^{+}10 + {}^{+}1 = {}^{+}11$

$0 + {}^{+}12 = {}^{+}12$

${}^{+}2 + {}^{+}11 = {}^{+}13$

${}^{+}1 + {}^{+}16 + {}^{-}3 = {}^{+}14$

${}^{-}20 + {}^{+}35 = {}^{+}15$

${}^{+}13 + {}^{+}3 = {}^{+}16$

${}^{+}9 + {}^{+}8 = {}^{+}17$

${}^{-}25 + {}^{+}43 = {}^{+}18$

${}^{+}21 + {}^{-}2 = {}^{+}19$

${}^{+}19 + {}^{+}1 = {}^{+}20$

${}^{+}11 + {}^{+}5 + {}^{+}5 = {}^{+}21$

${}^{+}23 + {}^{+}21 + {}^{-}22 = {}^{+}22$

${}^{+}26 + {}^{-}3 = {}^{+}23$

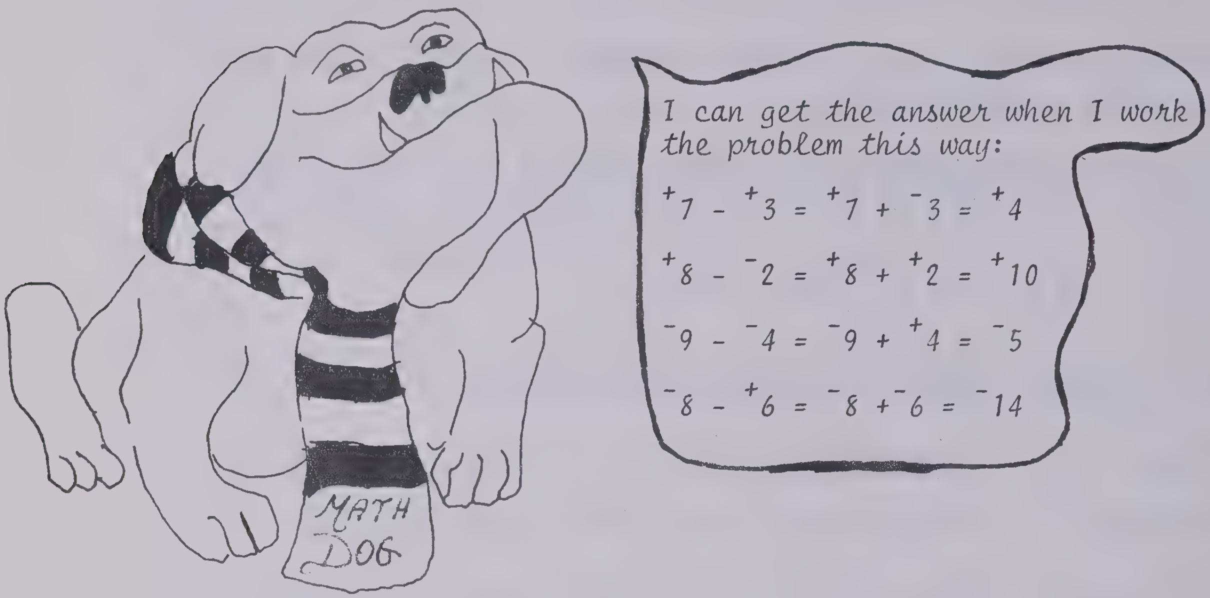
${}^{+}13 + {}^{+}11 = {}^{+}24$

${}^{+}50 + {}^{+}25 + {}^{-}50 = {}^{+}25$

${}^{-}5 + {}^{-}14 = {}^{-}19$

EXERCISES: UNIT IV OBJECTIVE NO. A-8

A. Solve the following problems and decode the message below to find out what you will say to yourself when you are finished this exercise.


MATH DOG
I can get the answer when I work the problem this way:
$^{+}7 - ^{+}3 = ^{+}7 + ^{-}3 = ^{+}4$
$^{+}8 - ^{-}2 = ^{+}8 + ^{+}2 = ^{+}10$
$^{-}9 - ^{-}4 = ^{-}9 + ^{+}4 = ^{-}5$
$^{-}8 - ^{+}6 = ^{-}8 + ^{-}6 = ^{-}14$

J $^{+}5 - ^{-}7 = ^{+}5 + ^{+}7 = ^{+}12$
C $^{+}6 - ^{+}3 =$
D $^{-}10 - ^{+}4 =$
E $^{+}7 - ^{+}3 =$
F $^{+}15 - ^{-}5 =$

G $^{-}1 - ^{-}1 =$
H $^{+}20 - ^{+}2 =$
I $^{+}3 - ^{-}5 =$
N $^{+}6 - ^{+}4 =$
O $^{-}5 - ^{-}6 =$

R $^{-}30 - ^{+}3 =$
S $^{+}6 - 0 =$
T $^{-}5 - ^{+}2 =$
X $^{+}8 - ^{-}2 =$
Y $^{-}9 - ^{-}4 =$

+8   +4 +2 +12 +1 -5 +4 -14   -14 +1 +8 +2 0

-7 +18 +8 +6   +6 +4 -7   +1 +20

+4 +10 +4 -33 +3 +8 +6 +4 +6

B. 1. Fill in the □ and △ in each question.

a. $^{+}5 - {}^{-}6 = {}^{+}5 + \boxed{^{+}6} = \triangle\,{}^{+}11$

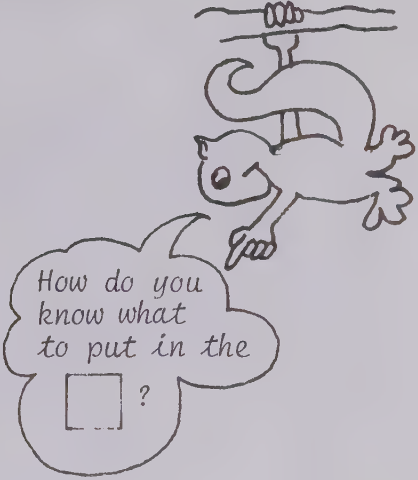
b. $^{+}9 - {}^{-}2 = {}^{+}9 + \square = \triangle\,{}^{+}11$

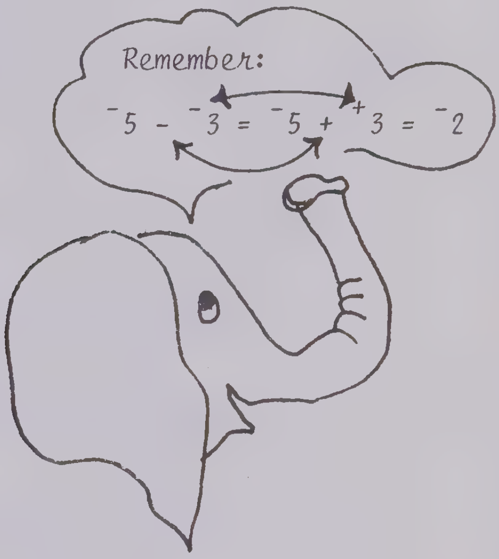
c. $^{-}4 - {}^{+}3 = {}^{-}4 + \square = \triangle$

d. $^{+}5 - {}^{+}8 = {}^{+}5 + \square = \triangle$

e. $^{-}7 - {}^{-}2 = {}^{-}7 + \square = \triangle$

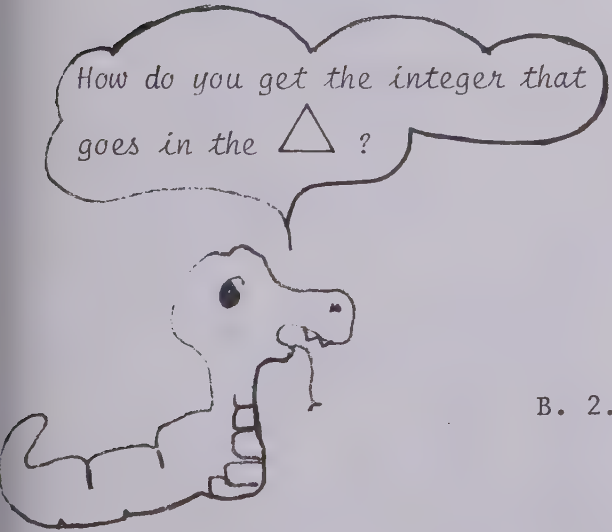
f. $^{-}12 - {}^{-}15 = {}^{-}12 + \square = \triangle$


How do you know what to put in the □ ?



Hint:

1. *Change the subtract sign to add.*
2. *Change the sign of the number following the subtract sign.*
3. *Follow the adding rules.*


How do you get the integer that goes in the △ ?

B. 2. Fill in the ○ and △ in each question.

a. $^{-}5 - {}^{-}3 = {}^{-}5 \oplus {}^{+}3 = \triangle\,{}^{-}2$

b. $^{+}4 - {}^{-}5 = {}^{+}4 \bigcirc {}^{+}5 = \triangle\,{}^{+}9$

c. $^{-}9 - {}^{+}2 = {}^{-}9 \bigcirc {}^{-}2 = \triangle$

d. $^{-}6 - {}^{-}8 = {}^{-}6 \bigcirc {}^{+}8 = \triangle$

e. $^{+}7 - {}^{+}8 = {}^{+}7 \bigcirc {}^{-}8 = \triangle$

f. $^{-}15 - {}^{-}9 = {}^{-}15 \bigcirc {}^{+}9 = \triangle$

B.3. Fill in the $\bigcirc$, $\square$ and $\triangle$ in each question.

a. $^{-}6 - {}^{-}2 = {}^{-}6 + {}^{+}2 = {}^{-}4$

b. $^{+}6 - {}^{+}3 = {}^{+}6 \bigcirc \square = \triangle\, {}^{+}3$

c. $^{-}15 - {}^{-}15 = {}^{-}15 \bigcirc \square = \triangle$

d. $^{+}20 - {}^{+}19 = {}^{+}20 \bigcirc \square = \triangle$

e. $0 - {}^{-}5 = 0 \bigcirc \square = \triangle$

f. $^{-}35 - {}^{+}15 = {}^{-}35 \bigcirc \square = \triangle$

g. $^{+}10 - {}^{-}3 = {}^{+}10 + {}^{+}3 = {}^{+}13$

h. $^{-}5 - {}^{+}3 = \triangle$

i. $^{+}20 - {}^{-}4 = \triangle$

j. $^{-}15 - {}^{-}7 = \triangle$

k. $^{+}4 - {}^{+}11 = \triangle$

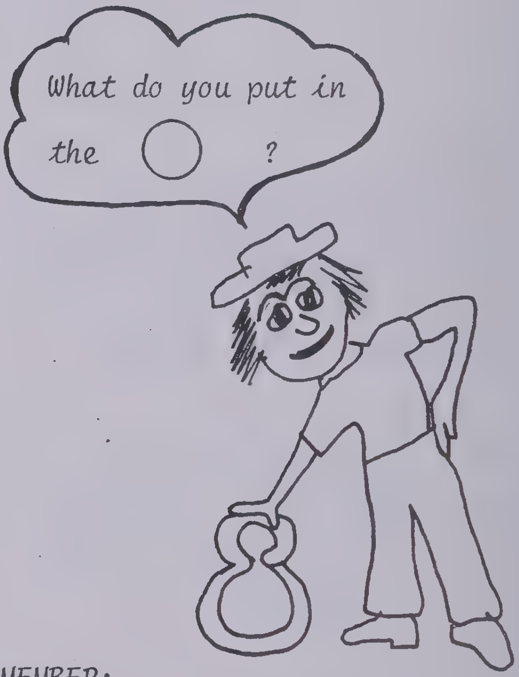
l. $^{-}2 - {}^{+}17 = \triangle$

m. $^{-}2 - {}^{-}7 - {}^{+}3 = {}^{-}2 + {}^{+}7 + {}^{-}3 = {}^{+}2$

n. $^{+}5 - {}^{+}3 - {}^{-}4 = \triangle$

o. $^{-}3 - {}^{-}7 - {}^{-}6 = \triangle$

p. $^{+}2 - {}^{+}3 - {}^{+}8 = \triangle$


What do you put in the ○ ?

REMEMBER:

1. *Change the subtract sign to add.*
2. *Change the sign of the second number.*
3. *Follow the adding rules.*

$$^{+}2 - {}^{-}4 = {}^{+}2 + {}^{+}4 = {}^{+}6$$

C. Complete the subtraction squares below :

Directions:

+2	+5	+7
-6	+3	-9
+8	-8	+16

Subtract the numbers across the page.

$^{+}2 - {}^{-}5 = {}^{+}2 + {}^{+}5 = {}^{+}7$

$^{-}6 - {}^{+}3 = {}^{-}6 + {}^{-}3 = {}^{-}9$

$^{+}8 - {}^{-}8 = {}^{+}8 + {}^{+}8 = {}^{+}16$

Subtract the numbers down the page

$^{+}2 - {}^{-}6 = {}^{+}2 + {}^{+}6 = {}^{+}8$

$^{-}5 - {}^{+}3 = {}^{-}5 + {}^{-}3 = {}^{-}8$

$-7 - {}^{-}9 = {}^{+}7 + {}^{+}9 = {}^{+}16$

Notice that you obtain the same answer across AND down.

1.

+3	-8	
+7	-5	

2.

-15	+3	
+7	-9	

3.

+4		+14
	+6	-9
+7		

*4. Make a subtraction square of your own.

A. Examples:

Notice that the sign of each number in the product is positive.

The sign of the answer is also positive.

a. $\boxed{+}2 \times \boxed{+}4 = \boxed{+}8$

b. $\boxed{+}3 \times \boxed{+}5 = \boxed{+}15$

1. Do the following multiplication exercises with positive integers.

a. $^+3 \times {}^+4 = {}^+$

b. $^+6 \times {}^+2 = {}^+$

c. $^+1 \times {}^+4 = {}^+$

d. $^+7 \times {}^+3 = {}^+$

e. $^+4 \times {}^+5 = {}^+$

REMEMBER:

Positive X Positive = Positive

+ x + = +

f. $^+6 \times {}^+5 =$

g. $^+3 \times {}^+8 =$

h. $^+12 \times {}^+2 =$

i. $^+5 \times {}^+9 =$

j. $^+7 \times {}^+8 =$

B. Now let's multiply two negative integers.

Examples:

Note that the signs are both negative

But, the answer is still positive

a. $\boxed{-}2 \times \boxed{-}5 = \boxed{+}10$

b. $\boxed{-}6 \times \boxed{-}4 = \boxed{+}24$

1. Do the following:

a. $^-4 \times {}^-2 = {}^+$_____

b. $^-3 \times {}^-8 = {}^+$_____

c. $^-7 \times {}^-6 = {}^+$_____

d. $^-5 \times {}^-7 = \square 35$

e. $^-8 \times {}^-6 = \square 48$

Sign?

f. $^-4 \times {}^-9 =$ _____

g. $^-9 \times {}^-7 =$ _____

h. $^-8 \times {}^-5 =$ _____

i. $^-3 \times {}^-15 =$ _____

j. $^-2 \times {}^-11 =$ _____

REMEMBER:

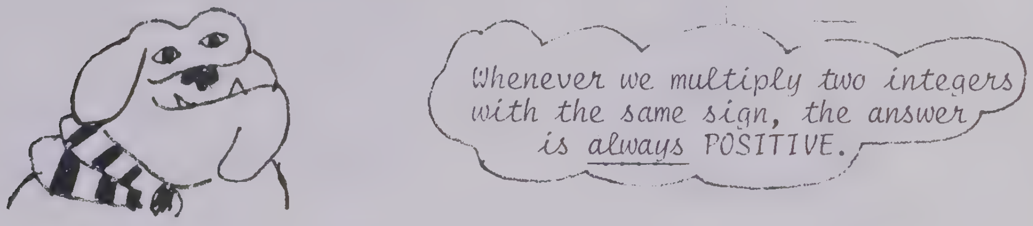
Negative X Negative = Positive

- x - = +

C. Let's review the two rules about multiplication of integers so far.

1. Positive x Positive = ____________

2. Negative x Negative = ____________


Whenever we multiply two integers with the same sign, the answer is always POSITIVE.

D. Now try applying the above rule to the following.
Fill in the square or the blank.

1. $\square 3$ x $^{+}8$ = $^{+}24$

2. $^{-}6$ x $\square 5$ = $^{+}30$

3. $^{-}4$ x ___ = $^{+}28$

4. $^{+}6$ x ___ = $^{+}42$

5. ___ x $^{-}7$ = $^{+}35$

E. What happens if one integer is positive and one is negative?

Examples: Note: One sign is positive and one is negative.

O O o and the answer is negative.

$\boxed{+}2$ x $\boxed{-}4$ = $\boxed{-}8$

$\boxed{-}3$ x $\boxed{+}5$ $\boxed{-}15$

Now try these:

1. $^{+}2$ x $^{-}5$ = ______

2. $^{+}4$ x $^{-}3$ = ______

3. $^{-}6$ x $^{-}3$ = ______

4. $^{-}7$ x $^{+}4$ = ______

5. $^{+}8$ x $^{-}7$ =

6. $^{-}2$ x $^{+}15$ = ______

7. $^{+}5$ x $^{-}9$ = ______

8. ______ x $^{+}6$ = $^{-}24$

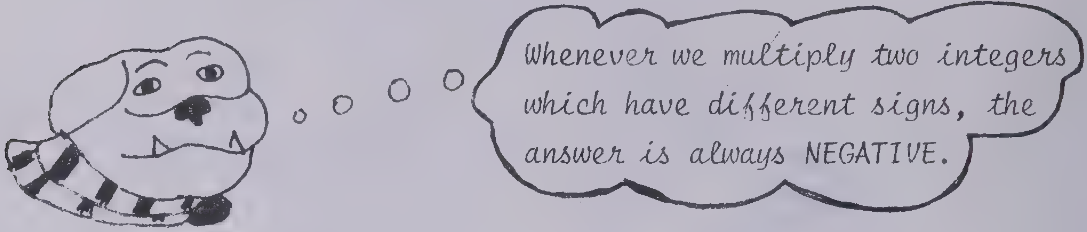
9. $^{-}8$ x ____ = $^{-}16$

10. $^{-}4$ x = $^{-}20$

F. Now review that rule we have just completed.

a. Negative x Positive = ______________

b. Positive x Negative = ______________


Whenever we multiply two integers which have different signs, the answer is always NEGATIVE.

Division

In doing the operation of division with integers, the same four rules exist that we learned in multiplication.

Examples:

1. Positive ÷ Positive = Positive

$^{+}8 \div {}^{+}2 = {}^{+}4$

2. Negative ÷ Negative = Positive

$^{-}8 \div {}^{-}2 = {}^{+}4$

3. Positive ÷ Negative = Negative

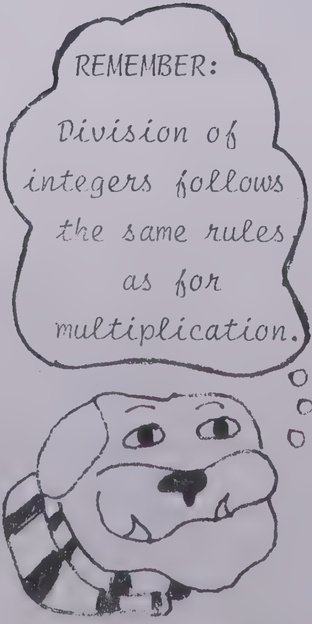
$^{+}8 \div {}^{-}2 = {}^{-}4$

4. Negative ÷ Positive = Negative

$^{-}8 \div {}^{+}2 = {}^{-}4$

G. Divide the following.

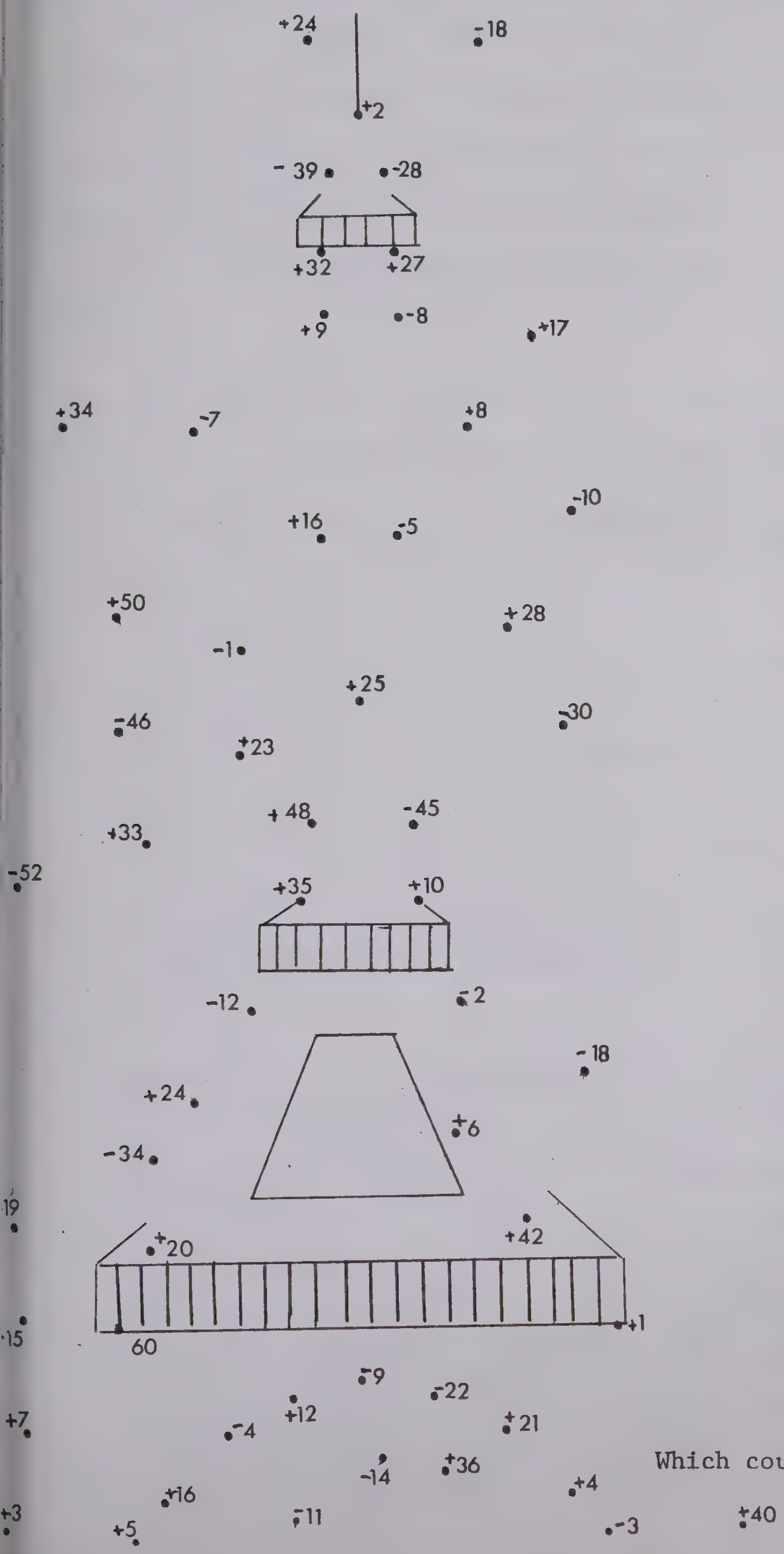
1. $^{+}16 \div {}^{+}2 =$
2. $^{+}8 \div {}^{+}4 =$
3. $^{+}10 \div {}^{+}5 =$
4. $^{+}21 \div {}^{+}7 =$
5. $^{-}16 \div {}^{-}4 =$
6. $^{-}30 \div {}^{-}5 =$
7. $^{-}28 \div {}^{-}7 =$
8. $^{-}40 \div {}^{-}8 =$
9. $^{+}32 \div {}^{-}8 =$


REMEMBER:
Division of integers follows the same rules as for multiplication.

10. $^{-}25 \div {}^{+}5 =$
11. $^{+}42 \div {}^{-}7 =$
12. $^{+}35 \div -5 =$
13. $^{-}15 \div {}^{-}3 =$
14. $^{+}24 \div {}^{+}6 =$
15. $^{-}27 \div {}^{+}9 =$
16. $^{+}40 \div {}^{-}5 =$
17. $^{-}56 \div {}^{-}8 =$
18. $^{+}45 \div {}^{-}9 =$

A VISIT TO EUROPE

H. Complete the following exercises by multiplying or dividing the integers given. Then locate the answers in the picture and join dots in the order of the answers.

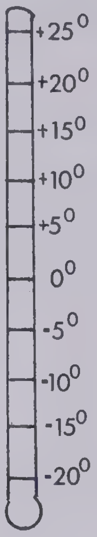


1. $^{+}8 \times {}^{+}6 =$
2. $^{+}5 \times {}^{+}7 =$
3. $^{-}4 \times {}^{+}3 =$
4. $^{-}5 \times {}^{-}4 =$
5. $^{+}10 \times {}^{-}6 =$
6. $^{+}14 \div {}^{+}2 =$
7. $^{-}18 \div {}^{-}6 =$
8. $^{+}25 \div {}^{+}5 =$
9. $^{-}8 \times {}^{-}2 =$
10. $^{-}4 \div {}^{+}1 =$
11. $^{+}6 \times {}^{+}2 =$
12. $^{+}9 \div {}^{-}1 =$
13. $^{+}2 \times {}^{-}11 =$
14. $^{-}7 \times {}^{-}3 =$
15. $^{-}40 \div {}^{-}10 =$
16. $^{-}33 \div {}^{+}11 =$
17. $^{+}5 \times {}^{+}8 =$
18. $^{-}9 \div {}^{-}9 =$
19. $^{-}14 \times {}^{-}3 =$
20. $^{+}32 \div {}^{-}16 =$
21. $^{-}10 \times {}^{-}1 =$
22. $^{-}5 \times {}^{+}9 =$
23. $^{-}50 \div {}^{+}10 =$
24. $^{-}24 \div {}^{+}3 =$
25. $^{+}3 \times {}^{+}9 =$
26. $^{-}7 \times {}^{+}4 =$
27. $^{-}28 \div {}^{-}14 =$
28. $^{+}13 \times {}^{-}3 =$
29. $^{+}4 \times {}^{+}8 =$
30. $^{+}18 \div {}^{+}2 =$
31. $^{-}4 \times {}^{+}4 =$
32. $^{-}2 \times {}^{-}24 =$

Which country in Europe does this picture represent? ______________

A. Observe the thermometer below, and answer the following questions.

Notice: Temperatures which are greater than 0 are positive. Those that are less than 0 are negative integers.



1. Which temperature is higher: $^{+}15^{\circ}$ or $^{+}10^{\circ}$ _____
2. Which temperature is higher: $^{-}5^{\circ}$ or $^{+}10^{\circ}$ _____
3. Which temperature is higher: $^{-}10^{\circ}$ or $^{-}5^{\circ}$ _____
4. Which temperature is lower: 0° or $^{-}15^{\circ}$ _____
5. Which temperature is lower: $^{-}5^{\circ}$ or $^{+}5^{\circ}$ _____
6. Which temperature is equal to $^{-}10^{\circ}$ _____

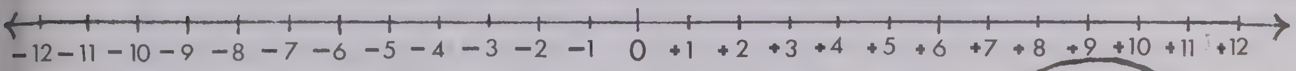
B. Now let's write the above question in the form of sentences. The first one is done for you. Complete the others.

1. $^{+}15^{\circ}$ is greater than $^{+}10^{\circ}$
2. $^{+}10^{\circ}$ is greater than _____
3. _____ is greater than $^{-}10^{\circ}$
4. _____ is less than 0°
5. _____ is less than _____
6. $^{-}10^{\circ}$ is equal to _____

C. Complete the following sentences with any suitable temperatures from the above thermometer. Do not use temperatures used in Exercise B.

1. _______ is greater than $^{+}20^{\circ}$.
2. $^{+}8^{\circ}$ is less than _________.
3. _______ is equal to $^{-}15^{\circ}$.
4. $^{-}10^{\circ}$ is less than _________.
5. _________ is greater than _______

Now observe the number line below and the examples which follow:



Examples;

1. $^{+}7$ is greater than $^{+}1$
2. 0 is less than $^{+}1$
3. $^{-}4$ is less than $^{-}3$
4. $^{-}3$ is greater than $^{-}4$
5. $^{-}10$ is equal to $^{-}10$

NOTICE:
Whatever integer is farthest to the right on the number line is larger, and the integer which is farthest to the left is smaller.

D. Use the integers in brackets and put them in the correct blanks:

1. ($^{+}3$, $^{+}8$) ________ is greater than ________.
2. (0, $^{-}4$) ________ is greater than ________.
3. ($^{-}5$, $^{-}7$) ________ is less than ________.
4. ($^{-}12$, $^{-}6$) ________ is less than ________.
5. ($^{+}5$, $^{-}4$) ________ is greater than ________.

E. Now instead of using the phrases "is greater than", "is less than", or "is equal to", we will use symbols

ATTENTION: OBEY ALL NEW SIGNS

<

"is less than"

>

"is greater than"

=

"is equal to"

Examples: $^{+}7 > {}^{+}1$

$0 < {}^{+}1$

$^{-}4 < {}^{-}3$

$^{-}3 > {}^{-}4$

$^{-}10 = {}^{-}10$

F. Fill in the blanks with a suitable integer or symbol from the above number line.

1. $^{+}12$ > ____
2. $^{+}5$ < ____
3. ____ 0
4. ____ > $^{-}6$
5. $^{-}8$ < ____
6. $^{-}3$ ____
7. $^{+}7$ □ $^{+}10$
8. $^{-}3$ □ $^{-}9$
9. $^{-}2$ □ $^{-}2$
10. ____ □ ____

G. *A TONGUE TWISTER*

DIRECTIONS:

a. Complete each statement by putting the symbol < ,>, or = between the pairs of integers or expressions.

b. After completing "a", fill in the boxes after each statement with the S if you used the symbol <, or the letter E if you used the symbol =, of L if you used the symbol >.

c. Then fill in the blanks at the bottom of the page by matching the letters with the corresponding numbers of the questions.

d. After completing the tongue twister, try saying it as fast as you can.

	EXERCISE	LETTER
1.	$^{+}5$ ○ $^{+}20$	☐
2.	$^{+}15$ ○ $^{+}9$	☐
3.	$^{-}6$ ○ $^{-}6$	☐
4.	$^{-}12$ ○ $^{-}8$	☐
5.	$^{-}3$ ○ 0	☐
6.	$^{-}11$ ○ $^{+}11$	☐
7.	$^{+}6 + {}^{+}5$ ○ $^{+}13$	☐
8.	$^{+}10 + {}^{-}2$ ○ $^{-}1$	☐
9.	$^{-}9$ ○ $^{+}3 \times {}^{-}5$	☐
10.	$^{+}4$ ○ 6×0	☐
11.	$^{-}3 + {}^{-}9$ ○ $^{-}20$	☐
12.	$^{+}7 - {}^{+}5$ ○ $^{+}3$	☐
13.	$^{-}2 \times {}^{-}3$ ○ $^{+}4 + {}^{+}2$	☐
14.	$^{+}15 \div {}^{+}3$ ○ $^{-}18 \div {}^{-}2$	☐
15.	$^{+}4 - {}^{+}7$ ○ $^{-}1 \times {}^{+}6$	☐
16.	$^{-}17 + {}^{+}5$ ○ $^{-}4 \times {}^{+}6$	☐
17.	$^{+}1 \times {}^{-}11$ ○ $^{+}30 \div {}^{-}2$	☐
18.	$^{+}3 - {}^{-}6$ ○ $^{+}4 + {}^{-}4$	☐

___	I	___	___	Y	___	A	___	___	Y
5		2	9		4		11	16	

___	___	___	___	___	___	___	A	___	H	___	___	___	___
7	3	18	10	5	12	13		14		15	8	17	1

A. *Why did the lumberjack quit his job?*

To find the answer: Work any problem below and find the answer in the row of boxes. Put the letter of the problem in the proper box.

T $3\frac{3}{4} + 3\frac{3}{5} =$

N $\frac{5}{8} - \frac{1}{2} =$

C $\frac{5}{6} + \frac{1}{3} =$

O $15 \times \frac{1}{3} =$

E $\frac{3}{4} \times \frac{1}{10} =$

D $\frac{4}{5} \times \frac{3}{8} =$

L $8 \times 3\frac{1}{4} =$

I $\frac{7}{12} \times \frac{8}{21} =$

U $\frac{7}{9} \times \frac{5}{2} =$

A $\frac{1}{8} \times 56 =$

K $\frac{4}{5} - \frac{1}{6} =$

B $\frac{7}{8} \div \frac{7}{4} =$

S $\frac{9}{5} \div 15 =$

H $\frac{3}{8} \div \frac{7}{8} =$

$\frac{1}{2}$	$\frac{3}{40}$	$1\frac{1}{6}$	7	$1\frac{17}{18}$	$\frac{3}{25}$	$\frac{3}{40}$

$\frac{3}{7}$	$\frac{3}{40}$

$1\frac{1}{6}$	5	$1\frac{17}{18}$	26	$\frac{3}{10}$

$\frac{1}{8}$	5	$7\frac{7}{20}$

$\frac{3}{7}$	7	$1\frac{1}{6}$	$\frac{19}{30}$

$\frac{2}{9}$	$7\frac{7}{20}$

B. Decode the Daffynition:

An alarm clock is something....

_____ 7.540 8

_____ 4.25

_____ 27.93

_____ 50.99

_____ 11.47

_____ 40.257

_____ 10.75

_____ 7.540 8

_____ 33.575

_____ 10.75

_____ 47.994

_____ 11.47

_____ 5.72

_____ 3.899

_____ 29.03

_____ 17.917 2

_____ 33.575

_____ 7.540 8

_____ 29.03

_____ 26.77

_____ 7.540 8

_____ 4.25

_____ 5.72

_____ 4.25

_____ 25.283

Directions

To decode the rest of this daffynition, do the following:

1. Work any problem below and find your answer in the code on the left.
2. Each time the answer appears in the code, write the letter of that problem in the proper blank.

A $\begin{array}{r} 5.346 \\ +6.124 \\ \hline \end{array}$

H $\begin{array}{r} 27.54 \\ 3.765 \\ 2.2 \\ 0.07 \\ \hline \end{array}$

S $\begin{array}{r} 5.183 \\ 14.517 \\ 8.23 \\ \hline \end{array}$

D $\begin{array}{r} 18.93 \\ 1.324 \\ 27.5 \\ 0.24 \\ \hline \end{array}$

X $\begin{array}{r} 3.071 \\ 1.82 \\ 15.75 \\ 1.81 \\ \hline \end{array}$

U $\begin{array}{r} 27.807 \\ -\ 2.524 \\ \hline \end{array}$

P $\begin{array}{r} 75.001 \\ -14.689 \\ \hline \end{array}$

N $\begin{array}{r} 176.00 \\ -149.23 \\ \hline \end{array}$

F $\begin{array}{r} 124.875\ 3 \\ -\ 4.257\ 9 \\ \hline \end{array}$

E 4.3 x 2.5 =

L 5.57 x 0.7 =

T 31.42 x 0.24 =

V 20.071 x 0.003 =

R 19.17 x 2.1 =

O 55.15 ÷ 13 =

B 94.34 ÷ 5.3 =

I 525.443 ÷ 18.1 =

W 25.465 6 ÷ 1.84

X 127.42 ÷ 2.3 =

C $\begin{array}{r} 34.23 \\ +16.76 \\ \hline \end{array}$

Z $\begin{array}{r} 142.372 \\ +38.125 \\ \hline \end{array}$

G 5.67 x 3.16 =

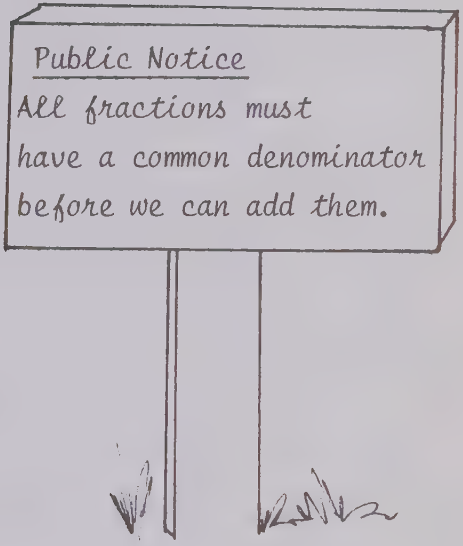
Y 14.3 ÷ 2.5 =

Remember, follow the rules for adding integers when you add the numerators.

A. Example: $\frac{-1}{7}+\frac{3}{7}=\frac{-1+3}{7}=\frac{2}{7}$

Notice! We do not add the denominators

1. $\frac{2}{5}+\frac{-1}{5}=\frac{2+{}^{-}1}{\square}=$ ____
2. $\frac{-3}{8}+\frac{2}{8}=\frac{\square+\square}{8}=$ ____
3. $\frac{-3}{2}+\frac{-4}{2}=\frac{\square+\square}{2}=$ ____
4. $\frac{-2}{6}+\frac{3}{6}=\frac{\square+\square}{\square}=$ ____
5. $\frac{3}{5}+\frac{-4}{5}+\frac{1}{5}=\frac{3+{}^{-}4+{}^{-}1}{5}=\frac{-2}{5}$
6. $\frac{-3}{4}+\frac{1}{4}+\frac{1}{4}=\frac{{}^{-}3+1+1}{4}=$ ____
7. $\frac{3}{9}+\frac{1}{9}+\frac{{}^{-}2}{9}=$ ________ = ___



Public Notice

All fractions must have a common denominator before we can add them.

B. More practice in adding rational numbers.

1. $\frac{-3}{4}+\frac{1}{2}=\frac{-3}{4}+\frac{2}{4}=\frac{-3+2}{4}=\frac{-1}{4}$
2. $\frac{-5}{6}+\frac{-2}{3}=\frac{-5}{6}+\frac{\square}{6}=\frac{-5+\square}{6}=$ ____
3. $\frac{3}{8}+\frac{-5}{4}=\frac{3}{8}+\frac{\square}{\square}=\frac{\square+\square}{\square}=$ ____
4. $\frac{3}{10}+\frac{-5}{2}=\frac{3}{10}+\frac{\square}{\square}=\frac{\square+\square}{\square}=$ ____
5. $\frac{-2}{3}+\frac{-4}{5}=\frac{-10}{15}+\frac{\square}{15}=\frac{-10+\square}{15}=$ ____
6. $\frac{2}{3}+\frac{-3}{4}=\frac{8}{\square}+\frac{-9}{\square}=\frac{\square+\square}{\square}=$ ____
7. $-1\frac{1}{2}+3\frac{1}{2}=\frac{-3}{2}+\frac{7}{2}=\frac{\boxed{-3}+\boxed{7}}{2}-$ ________
8. $-1\frac{1}{4}+{}^{-}2\frac{1}{2}=\frac{\square}{4}+\frac{\square}{2}=\frac{\square}{4}+\frac{\square}{4}=\frac{\square+\square}{\square}=$ ________

C. Do the following exercises by yourself.

1. $\frac{-1}{5}+\frac{-3}{5}=$
2. $\frac{-1}{4}+\frac{7}{4}=$
3. $\frac{4}{6}+\frac{-3}{6}=$
4. $\frac{-5}{6}+\frac{2}{3}$
5. $\frac{3}{8}+\frac{-7}{4}=$
6. $\frac{-2}{3}+\frac{-4}{9}=$
7. $\frac{3}{5}+\frac{-5}{3}=$
8. $\frac{-2}{3}+\frac{3}{4}$
9. $\frac{-3}{5}+\frac{-5}{4}=$
10. $1\frac{1}{3}+\frac{-32}{3}=$
11. $-4\frac{1}{4}+2\frac{1}{2}=$
12. $-2\frac{2}{3}+-2\frac{5}{6}=$

D. *Find the Bingo*

Directions

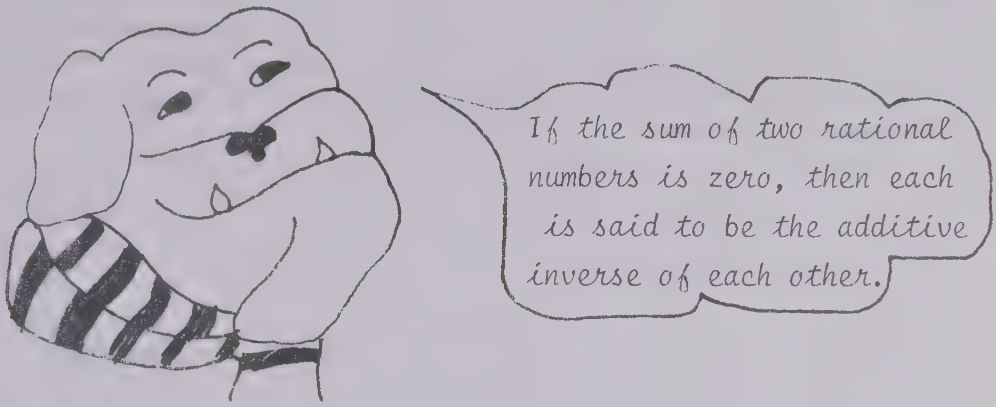
Work any problem below and find your answer in the bingo. Circle the answer. Keep working the problems in any order until you have five circle answers in a line - horizontally, vertically, or diagonally.

1. $\frac{1}{6} + \frac{4}{6} =$
2. $\frac{-1}{2} + \frac{2}{3} =$
3. $\frac{2}{5} + \frac{-1}{3}$
4. $\frac{-3}{5} + \frac{-2}{15} =$
5. $\frac{2}{9} + \frac{1}{3} =$
6. $-2\frac{1}{3} + 1\frac{1}{3} =$
7. $-1\frac{3}{5} + 2\frac{2}{15} =$
8. $\frac{-4}{5} + \frac{3}{4} =$
9. $1\frac{1}{2} + 3\frac{1}{3} =$
10. $\frac{6}{7} + \frac{1}{2} =$
11. $\frac{2}{3} + {}^{-}1\frac{1}{4} =$
12. $-2\frac{1}{2} + {}^{-}4\frac{1}{6} =$
13. $\frac{-5}{6} + \frac{-7}{8} =$
14. $2\frac{1}{4} + \frac{1}{3} =$

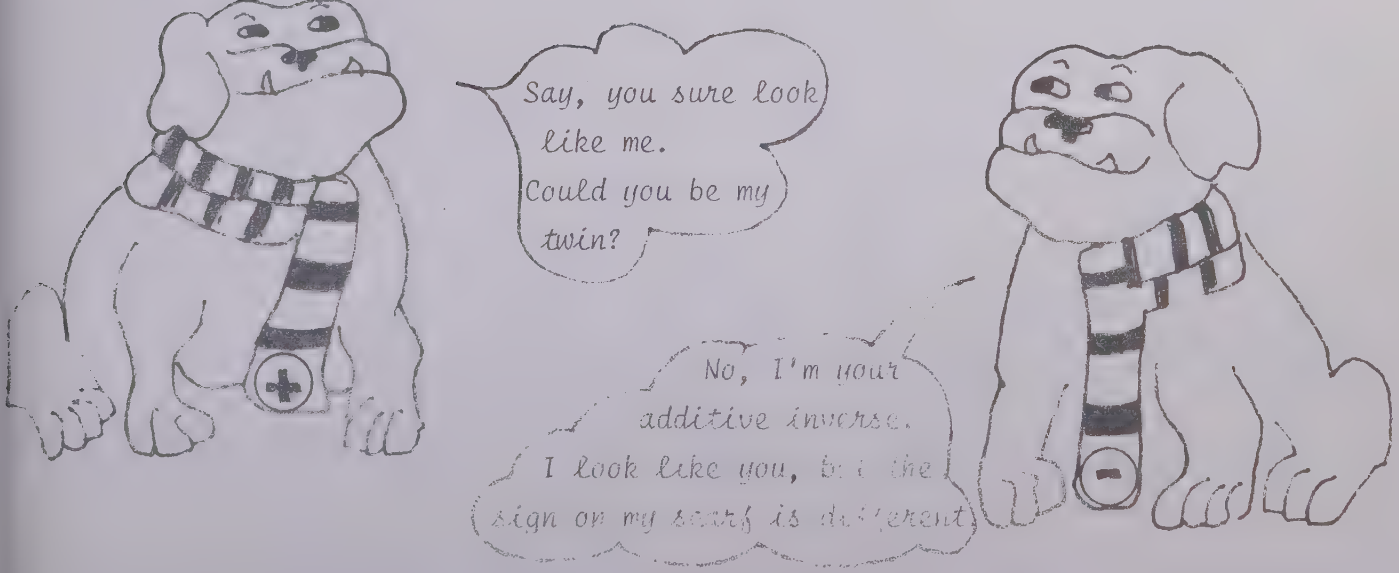
$-6\frac{2}{3}$	$\frac{-7}{12}$	$1\frac{2}{3}$	$\frac{6}{7}$	$\frac{5}{6}$
$-1\frac{17}{24}$	$\frac{-1}{20}$	$4\frac{5}{6}$	$\frac{1}{6}$	$2\frac{2}{15}$
$\frac{-5}{6}$	$\frac{7}{15}$	$\frac{1}{15}$	$2\frac{2}{3}$	${}^{-}1$
$1\frac{5}{14}$	$-4\frac{5}{6}$	$\frac{4}{9}$	$2\frac{7}{12}$	$\frac{1}{3}$
$\frac{-7}{11}$	$\frac{8}{15}$	$\frac{-11}{15}$	$-5\frac{2}{3}$	$\frac{5}{9}$

EXERCISES: UNIT IV OBJECTIVE NO. B-6

A.

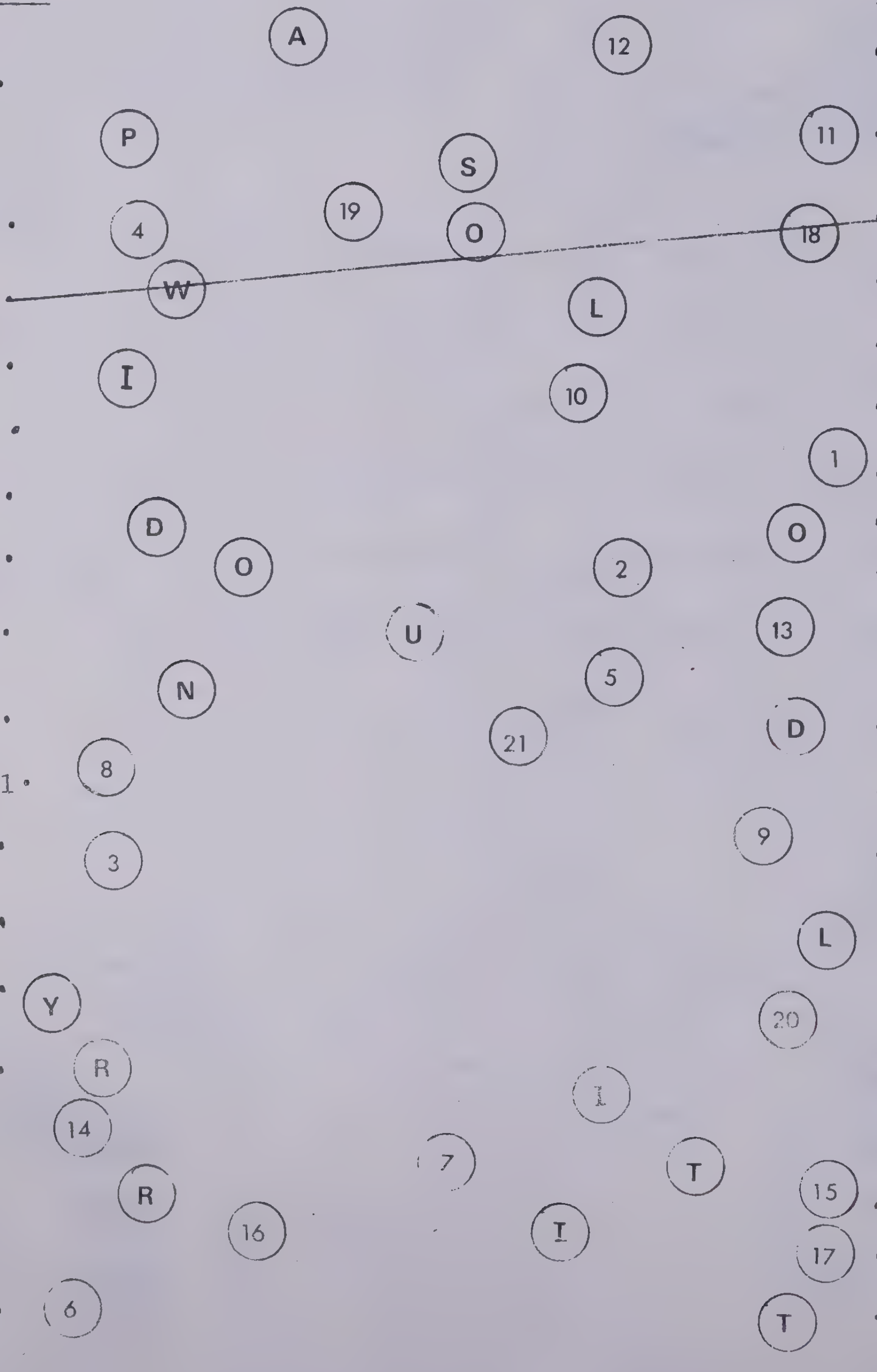

If the sum of two rational numbers is zero, then each is said to be the additive inverse of each other.

1. The additive inverse of ${}^{+}7$ is ${}^{-}7$ because ${}^{+}7 + {}^{-}7 = 0$
2. The additive inverse of $\frac{+3}{4}$ is $\frac{-3}{4}$ because $\frac{+3}{4} + \frac{-3}{4} =$ ○
3. The additive inverse of $\frac{+4}{7}$ is ○ because $\frac{+4}{7} + \frac{-4}{7} = 0$
4. The additive inverse of $\frac{-2}{3}$ is ○ because $\frac{-2}{3} + \frac{+2}{3} =$ ○
5. The additive inverse of $4\frac{5}{8}$ is $-4\frac{5}{8}$ because $4\frac{5}{8} +$ ○ $= 0$
6. The additive inverse of $-17\frac{3}{4}$ is ○ because $-17\frac{3}{4} + {}^{+}17\frac{3}{4} = 0$
7. The additive inverse of -0.3 is ○ because ○ + ○ = 0


Say, you sure look like me. Could you be my twin?
No, I'm your additive inverse. I look like you, but the sign on my scarf is different.

B. Always remember this if you want to have a pleasant world to live in. To find out what to remember, follow the directions below. The rational number in Column B are the additive inverse of the rational numbers in Column A. Draw a straight line connecting the dot after each rational number from Column A with its additive inverse in Column B. Each line will cross a letter and a number. The number tells you where to put the letter in the line of boxes at the bottom of the page. An example is done for you.

Column A	Column B
$+\frac{2}{3}$	$+\frac{2}{3}$
$+1.2$	$+\frac{4}{5}$
$-1\frac{4}{5}$	$-\frac{17}{8}$
$-\frac{4}{5}$	$+1\frac{4}{5}$
$+1.21$	-1.21
$+\frac{17}{8}$	$+\frac{21}{26}$
$-\frac{21}{26}$	-1.2
$+19.1$	$+14.81$
$-\frac{5}{8}$	$-1\frac{1}{2}$
$+1\frac{1}{2}$	$+\frac{5}{8}$
$+\frac{4}{5}$	$+\frac{3}{7}$
$-\frac{3}{7}$	-19.1
-14.81	$-\frac{4}{5}$
$+\frac{3}{4}$	$-\frac{3}{4}$
$-\frac{5}{7}$	$-\frac{15}{14}$
$+1\frac{4}{5}$	0
$+\frac{15}{14}$	$-\frac{7}{3}$
0	$+8$
-8	$-1\frac{4}{5}$
$+\frac{7}{3}$	$-1\frac{4}{7}$
$+1\frac{4}{7}$	$+\frac{5}{7}$



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
																	W			

A.

Remember! ! !

1. *Change the subtract sign to add.*
2. *Change the sign of the second number.*
3. *Follow the adding rules.*

Examples:

1. $\frac{^-2}{3} - \frac{-6}{5} = \frac{-2}{3} + \frac{+6}{5} = \frac{-10}{15} + \frac{18}{15} = \frac{-8}{15}$

2. ${}^+14.1 - {}^+2.3 = {}^+14.1 + {}^-2.3 = {}^+11.8$

Finish the parts of the questions that are missing. Put your answer(s) in the square(s). The first one is done for you.

1. $\frac{-2}{5} - \frac{+3}{5} = \frac{-2}{5} + \boxed{-}\,\frac{3}{5} = \frac{-5}{5} = -1$

2. $\frac{+6}{8} - \frac{-3}{4} = \frac{+6}{8}\ \square\ \frac{+3}{4} = \square + \square = +1\frac{1}{2}$

3. $+1\frac{2}{3} - {}^-2\frac{1}{5} = \frac{+5}{3} + {}^+\square = \frac{+25}{15} + \frac{\square}{15} = +3\frac{13}{15}$

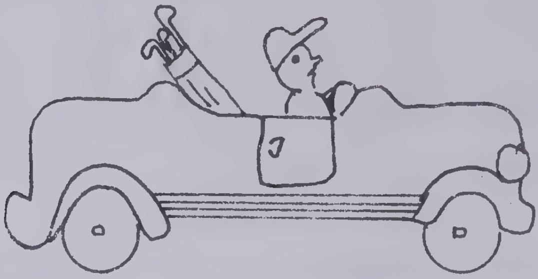
4. $\frac{-15}{16} - \frac{+17}{32} = \frac{-15}{16} + \frac{-17}{32} = \frac{-30}{\square} + \frac{-17}{\square} = \frac{-47}{32}$

5. $\frac{+7}{5} - \frac{+2}{7} = \frac{+7}{5}\ \square\ \frac{^{\square}2}{7} = \frac{\square}{35} + \frac{\square}{35} = \frac{\square}{35}$

6. $+5\frac{3}{4} - {}^+6\frac{2}{3} = \frac{+23}{4} + \frac{-20}{3} = \square + \square = \square$

7. $-13.2 - {}^-7.3 = -13.2\ \square\ \square = \square$

B. *How well can you drive?*



Solve the problems below and decode the answer by putting the letter in the proper blank. The first question is done for you.

W: $\frac{-6}{7} - {}^{-}3 = \frac{-6}{7} + {}^{+}3 = \frac{-6}{7} + \frac{+21}{7} = \frac{+15}{7}$ or $+2\frac{1}{7}$

L: $\frac{-3}{5} - {}^{+}1\frac{2}{3} =$

S: $+3\frac{2}{5} - {}^{+}1\frac{1}{5} =$

E: $-46.8 - {}^{-}34.88 =$

A: $+3 - {}^{+}\frac{0}{8} =$

F: $-15.6 - 3.2 =$

Y: $25.7 - {}^{-}28 =$

N: $-2.13 + 0.62 - {}^{-}46.1 =$

O: $\frac{+2}{3} + \frac{+1}{5} - \frac{-1}{2} =$

R: $0.75 - 2.061 =$

G: $-12 - {}^{-}8 =$

REMEMBER!

1. *Change the subtract sign to add.*
2. *Change the sign of the second number.*
3. *Follow the adding rules.*

____	____	W	____	____	____		____	____
3	$2\frac{1}{5}$	$\frac{+15}{7}$	-11.92	$\frac{-34}{15}$	$\frac{-34}{15}$		3	$2\frac{1}{5}$

____	____	____	____	____	____	____	____	____
3	46.10	53.7	-4	$\frac{41}{30}$	$\frac{-34}{15}$	-18.8	-11.92	1.311

C. *What is your admission?*

First, work any problem below and find your answer in the code at the bottom of the page. Place the letter of the problem in the space above each answer. Use the same letter for identical answers. See the example.

M : $-20\frac{1}{2} - {}^{+}2\frac{1}{4} = \frac{41}{2} + {}^{-}\frac{9}{4} = \frac{-82}{4} + \frac{-9}{4} = \frac{-91}{4} = {}^{-}22\frac{3}{4}$

A : $\frac{1}{2} - \frac{-1}{4} =$

D : $\frac{-3}{4} - \frac{+5}{4} =$

E : $\frac{-1}{2} - \frac{+3}{4} =$

I : $2\frac{3}{4} - \frac{-1}{3} =$

N : $-2.75 - 1.5 =$

O : $3.9 - {}^{-}2.3 =$

S : ${}^{+}15.5 - {}^{+}4.25 =$

T : $-5.75 - 2.4 =$

U : $1.5 - {}^{-}2.75 =$

W : $-15.5 - {}^{-}4.25 =$

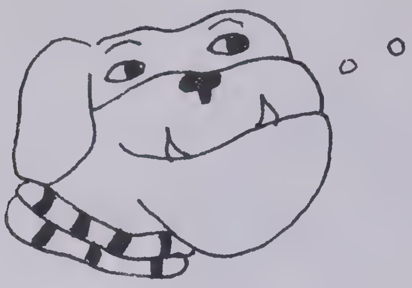
Y : $5.75 - {}^{-}2.4 =$

	M			
$3\frac{1}{12}$	$-22\frac{3}{4}$	4.25	11.25	-8.15

		M									
$\frac{3}{4}$	$\frac{-1}{2}$	${}^{-}22\frac{3}{4}$	$3\frac{1}{12}$	-8.15		$3\frac{1}{2}$	-8.15		-11.25	$\frac{3}{4}$	11.25

-4.25	6.2	-8.15		$-1\frac{1}{4}$	$\frac{3}{4}$	11.25	8.15

A.



To multiply any rational number, we use the same rules as for multiplying fractions.
HEY, THAT'S EASY.

$\frac{2}{3} \times \frac{4}{7} = \frac{2 \times 4}{3 \times 7} = \frac{8}{21}$

1. $\frac{3}{4} \times \frac{4}{5} = \frac{3 \times \square}{4 \times \square} = \bigcirc$

2. $\frac{7}{3} \times \frac{3}{5} = \frac{\square \times \square}{\square \times \square} = \bigcirc$

3. $1\frac{2}{3} \times \frac{2}{7} = \frac{5}{3} \times \frac{2}{7} = \frac{\square}{21}$

4. $2\frac{3}{4} \times \frac{3}{4} = \frac{\square}{\square} \times \frac{\square}{\square} = \underline{\qquad}$

5. $2\frac{1}{2} \times 3\frac{2}{5} = \frac{5}{2} \times \frac{17}{5} = \frac{85}{\square}$ or $8\frac{5}{10}$ or $8\frac{1}{2}$

6. $5\frac{1}{2} \times 2\frac{1}{3}$ $\frac{\square}{2} \times \frac{\square}{3} = \bigcirc$

NOTICE :

A mixed number such as $1\frac{2}{3}$ must be changed to an improper fraction before multiplying.

So $1\frac{2}{3} = \frac{5}{3}$

Interesting.

B.

When multiplying positive and negative rationals, we follow the rules we used for multiplying positive and negative integers.

(+) x (+) = +
(−) x (−) = +
(+) x (−) = −
(−) x (+) = −

1. $\frac{+3}{8} \times \frac{+4}{7}$ $\frac{+\square}{56}$

2. $\frac{-4}{3} \times \frac{-3}{5}$ $\frac{+12}{\square}$

3. $\frac{-4}{9} \times \frac{+2}{3}$ $\frac{-\square}{\square}$

4. $\frac{+3}{4} \times \frac{-2}{5}$ $\frac{-\square}{\square}$

Now work these out without help.

1. $+1\frac{1}{2} \times \frac{-3}{4} = \frac{+\square}{2} \times \frac{-\square}{4} = \bigcirc$

2. $\frac{+7}{8} \times \frac{+4}{3} = \frac{+7 \times +4}{8 \times 3} = \bigcirc$

3. $\frac{-2}{5} \times 2\frac{1}{2}$ $\frac{\square \times \square}{\square \times \square} = \bigcirc$

4. $-2\frac{1}{4} \times -3\frac{2}{3}$ $\frac{\square \times \square}{\square \times \square} = \bigcirc$

Did you use the correct signs?

C. To decode these three "daffynitions," follow MATH DOG'S directions:

1. Solve each question.
2. Find your answer in the code.
3. Each time the answer appears in the code, write the letter in the box above it.

N $\frac{+2}{3} \times \frac{+1}{6} =$

D $\frac{-1}{2} \times \frac{-4}{5} =$

G $\frac{-7}{8} \times \frac{+3}{4} =$

L $\frac{-2}{7} \times \frac{+5}{3} =$

Y $\frac{+15}{16} \times \frac{-1}{2} =$

F $\frac{+5}{8} \times \frac{+2}{3} =$

V $\frac{-4}{6} \times {}^{+}3\frac{3}{5} =$

R $\frac{-7}{8} \times \frac{-3}{4} =$

T $-2\frac{1}{2} \times {}^{-}3\frac{1}{3} =$

A $\frac{-3}{4} \times \frac{+1}{3} =$

C $-1\frac{1}{3} \times \frac{-1}{2} =$

E $+4 \times \frac{+3}{8} =$

I $\frac{-2\frac{1}{4}}{7} \times \frac{-1}{6} =$

K $\frac{+2}{7} \times \frac{+5}{3} =$

S $+1\frac{6}{7} \times \frac{-2}{5} =$

H $\frac{-2}{5} \times \frac{-1}{3} =$

U $\frac{+3}{8} \times -2\frac{2}{3} =$

D $+4\frac{3}{4} \times {}^{+}2\,\frac{2}{3} =$

lotine :

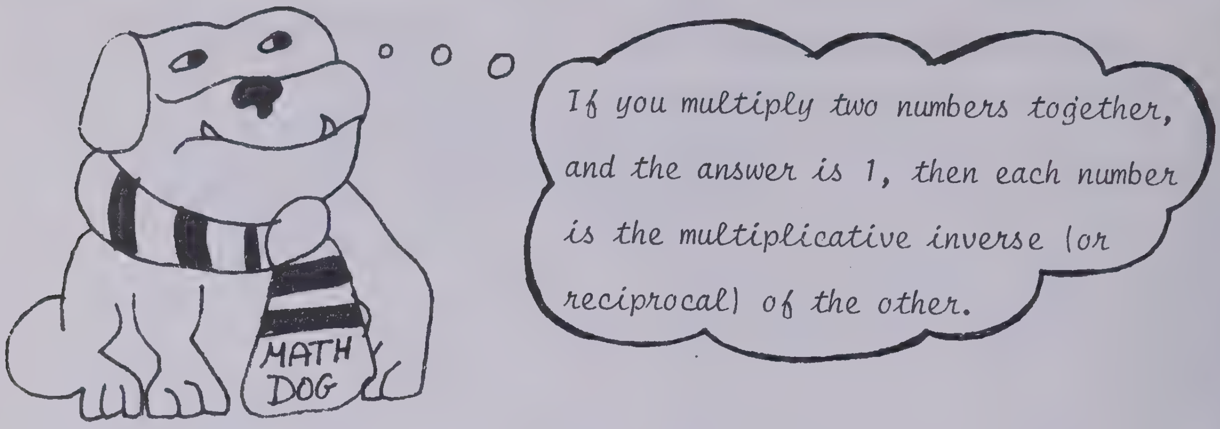
$\frac{-3}{12}$	$\frac{-26}{35}$	$\frac{+2}{15}$	$\frac{+152}{12}$	$\frac{+21}{32}$	$\frac{+50}{6}$	$\frac{+4}{6}$	-1	$\frac{+50}{6}$	$\frac{+50}{6}$	$\frac{+152}{12}$	$\frac{+2}{15}$	$\frac{+12}{8}$	$\frac{-3}{12}$	$\frac{-72}{30}$	$\frac{+12}{8}$	$\frac{+2}{18}$

odermic
eedle

$\frac{-3}{12}$	$\frac{-26}{35}$	$\frac{+9}{24}$	$\frac{+4}{6}$	$\frac{+10}{21}$	$\frac{-26}{35}$	$\frac{+2}{15}$	$\frac{+152}{12}$	$\frac{+152}{12}$	$\frac{+50}{6}$	$\frac{+12}{8}$	$\frac{+21}{32}$

adruplets:

$\frac{+10}{24}$	$\frac{+152}{12}$	-1	$\frac{+21}{32}$	$\frac{+4}{6}$	$\frac{+21}{32}$	$\frac{-15}{32}$	$\frac{+9}{24}$	$\frac{+2}{18}$	$\frac{-21}{32}$	$\frac{+152}{12}$	-1	$\frac{+50}{6}$	$\frac{-10}{21}$	$\frac{+152}{12}$	-1	$\frac{+4}{10}$


If you multiply two numbers together, and the answer is 1, then each number is the multiplicative inverse (or reciprocal) of the other.
MATH DOG

For example: $\frac{1}{3} \times 3 = \frac{3}{3}$ or 1, Therefore, $\frac{1}{3}$ is the multiplicative inverse of 3.

Also, 3 is the multiplicative inverse (or reciprocal) of $\frac{1}{3}$.

$\frac{2}{5} \times \frac{5}{2} = \frac{10}{10}$ or 1, Therefore, $\frac{2}{5}$ is the multiplicative inverse of $\frac{5}{2}$.

Also, $\frac{5}{2}$ is the ________ inverse of $\frac{2}{5}$

A. 1. What is the multiplicative inverse of $\frac{3}{4}$? Answer ____________________

2. What is the reciprocal of $\frac{3}{4}$? Answer ________________

3. How do you know that 4 is the multiplicative inverse of $\frac{1}{4}$?

Answer: Because the product of $4 \times \frac{1}{4}$ is ________.

NOTE: *The easiest way to find the multiplicative inverse of reciprocal of a number is to turn the rational number over.*

B. State the multiplicative inverse (reciprocal) of each of the following.

1. $\frac{2}{3}$ the multiplicative inverse is $\frac{3}{2}$ because $\frac{2}{3} \times \frac{3}{2} = \frac{6}{6}$ or 1.

2. $\frac{7}{8}$ the multiplicative inverse is _____ because $\frac{7}{8} \times \frac{8}{7} = 1$

3. $\frac{15}{16}$ the multiplicative inverse is _____ because $\frac{15}{16} \times \frac{16}{15} =$ _____.

4. 6 the multiplicative inverse is $\frac{1}{6}$ because $6 \times$ _____ $= 1$.

5. $1\frac{1}{4}$ the multiplicative inverse is $\frac{4}{5}$ because $\frac{5}{4} \times \frac{4}{5} =$ _____.

6. $2\frac{1}{3}$ the multiplicative inverse is _____ because $\frac{7}{3} \times$ _____ $= 1$.

7. 1.2 the multiplicative inverse is $\frac{1}{1.2}$ because $1.2 \times \frac{1}{1.2} = 1$.

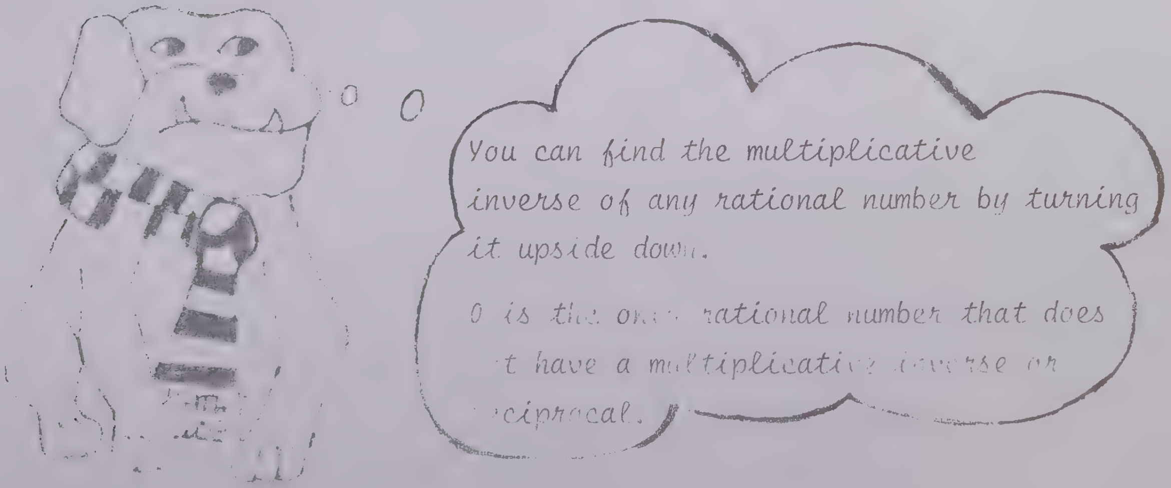
8. $\frac{1}{4}$ the multiplicative inverse is _____ because _____________.

9. $\frac{4}{7}$ the multiplicative inverse is ______ because _____________.

10. 2.8 the multiplicative inverse is _____ because $2.8 \times$ _____ $=$ ______.

NOTE: *0 is the only rational number that does* *__not__* *have a multiplicative inverse (reciprocal) because* $0 \times \frac{1}{0} \neq 1$.

There is no number you can multiply 0 by to get a product of 1.


You can find the multiplicative inverse of any rational number by turning it upside down.
0 is the only rational number that does not have a multiplicative inverse or reciprocal.

C. Write the multiplicative inverse or reciprocal of each of the following rational numbers.

1. $\frac{1}{4}$
2. $\frac{2}{5}$
3. $\frac{7}{8}$
4. $\frac{1}{7}$
5. $1\frac{1}{4}$
6. $2\frac{3}{5}$
7. $3\frac{1}{5}$
8. $4\frac{1}{4}$
9. 1.2
10. 3.4
11. 6.9
12. 11.2
13. 4
14. 9
15. 12
16. 17

REMINDER:

1. Change the division sign to a multiplication sign.
2. Find the reciprocal of the divisor or the second number.
3. Use your multiplication rules. (Review Rules)

EXAMPLE:

$$\frac{-1}{2} \div \frac{3}{4} = \frac{-1}{2} \times \frac{4}{3} = \frac{-4}{6} = \frac{-2}{3}$$

REMEMBER:

$(+) \times (+) = (+)$

$(-) \times (-) = (+)$

$(+) \times (-) = (-)$

$(-) \times (+) = (-)$

Review: idea of multiplicative inverses.

Remember: No signs means Positive Signs.

A. Complete the following by putting the correct answer in the box.

1. $\frac{1}{3} \div \frac{1}{4} = \frac{1}{3} \times \square = \frac{4}{3}$ or $1\frac{1}{3}$

2. $\frac{-5}{2} \div \frac{1}{2} = \square \times \frac{2}{1} = \frac{-10}{2}$ or -5

3. $\frac{7}{6} \div \frac{-5}{12} = \frac{7}{6} \times \square = \frac{-14}{5}$ or $-2\frac{4}{5}$

4. $\frac{-1}{2} \div \frac{-1}{4} = \frac{-1}{2} \square \frac{-4}{1} = \frac{4}{2}$ or 2

5. $-2\frac{1}{2} \div 3\frac{1}{3} = \frac{-5}{2} \div \frac{10}{3} = \frac{-5}{2} \times \square = \frac{-3}{4}$

B. To work the questions below, we can divide the work into 3 parts.

$$\underbrace{\frac{2}{3} \div \frac{5}{6}}_{\text{PART 1}} = \qquad \underbrace{\frac{2}{3} \times \frac{6}{5}}_{\text{PART 2}} = \qquad \underbrace{\frac{4}{5}}_{\text{PART 3}}$$

1. For each question below, part 1, draw a line to the correct statement under part 2.

2. From the correct statement under part 2, draw a line to the correct answer under part 3.

3. The first question is done for you.

	PART 1	PART 2	PART 3
1.	$\frac{-3}{5} \div \frac{+6}{10} =$	$\frac{5}{9} \times \frac{3}{2} =$	$\frac{+2}{3}$
2.	$\frac{5}{9} \div \frac{2}{3} =$	$\frac{1}{10} \times \frac{4}{5} =$	$\frac{+3}{10}$
3.	$\frac{-7}{13} \div \frac{-21}{26} =$	$\frac{6}{5} \times \frac{-10}{6} =$	-1
4.	$\frac{-2}{3} \div \frac{+7}{2} =$	$\frac{9}{11} \times \frac{-2}{1} =$	$\frac{14}{3}$
5.	$\frac{-1}{4} \div 3 =$	$\frac{-3}{5} \times \frac{10}{6} =$	$\frac{-4}{21}$
6.	$\frac{1}{10} \div \frac{5}{4} =$	$\frac{-1}{4} \times \frac{1}{3} =$	$\frac{2}{25}$
7.	$+7 \div \frac{+3}{2}$	$\frac{-13}{12} \times \frac{-6}{5} =$	$-1\frac{7}{11}$
8.	$\frac{+6}{5} \div \frac{-6}{10} =$	$\frac{-7}{13} \times \frac{-26}{21} =$	-2
9.	$\frac{-13}{12} \div \frac{-5}{6} =$	$\frac{-2}{3} \times \frac{2}{7} =$	$\frac{+5}{6}$
10.	$\frac{9}{11} \div \frac{-1}{2} =$	$7 \times \frac{2}{3} =$	$\frac{-1}{12}$

C. BINGO

1. Work any of the problems on rational numbers and find the answers in the bingo box.
2. Put an X through the answer.
3. When you have crossed out all of the outside squares, your work is finished.
4. The first question is done for you.

$\frac{1}{2}$	$-4\frac{1}{8}$	$1\frac{1}{8}$	$\frac{-3}{10}$	$\frac{32}{57}$
$\frac{-8}{9}$	$\frac{-4}{3}$	-13	$-2\frac{10}{21}$	$\cancel{\frac{+2}{5}}$
$\frac{-3}{4}$	$\frac{-6}{7}$	FREE	$\frac{3}{5}$	-25
0	$\frac{-9}{8}$	$\frac{9}{11}$	$\frac{-8}{33}$	$5\frac{1}{4}$
$\frac{-10}{3}$	$-2\frac{1}{2}$	32	$\frac{-8}{9}$	-1

$\frac{-1}{2} \div -1\frac{1}{4} = \frac{-1}{2} \div \frac{-5}{4} = \frac{-1}{2} \text{ x } \frac{-4}{5} = \frac{+2}{5}$

$1\frac{7}{8} \div -2\frac{1}{2} =$

$\frac{-3}{4} \div \frac{2}{3} =$

$-1\frac{6}{7} \div \frac{3}{4} =$

$5\frac{1}{2} \div 11 =$

$3\frac{3}{4} \div -1\frac{1}{2} =$

$\frac{-5}{6} \div \frac{1}{4} =$

$-1\frac{1}{3} \div -2\frac{3}{8} =$

$\frac{7}{8} \div \frac{7}{9} =$

$\frac{\text{[illegible]}}{11} \div -3 =$

$\frac{-9}{4} \div \frac{2}{5} =$

$-5 \div \frac{1}{5} =$

$2\frac{1}{2} \div 1\frac{7}{8} =$

$\frac{-1}{4} \div \frac{5}{6} =$

$\frac{-7}{9} \div \frac{7}{9} =$

$3 \div \frac{-8}{11} =$

$-10\frac{\text{[illegible]}}{\text{[illegible]}} \div -2 =$

$2 \div \frac{1}{16} =$

$\frac{\text{[illegible]}}{3} \div \frac{3}{4} =$

$\text{[illegible]} \div \frac{-1}{\text{[illegible]}} =$

A. Complete the following by putting the correct answers in the $\square$.

1. $\square \times \frac{+3}{5} = 0$

2. $-3.2 \times \square = 0$

3. $0 \times \frac{+16}{19} = \square$

4. $\square \times \frac{-3}{11} = 0$

5. $1 \times 0 = \square$

Remember:

Zero times any Rational Number is always Zero.

$\frac{-2}{3} \times 0 = 0$

$0 \times 2 = 0$

B. Complete the following by putting the correct answer in the $\square$.

1. $\frac{+2}{5} + 0 = \square$

2. $\square + 0 = 0$

3. $\square + \frac{-17}{21} = \frac{-17}{21}$

4. $21.3 + \square = 21.3$

5. $0 + {}^{-}6.2 = \square$

Zero plus any Rational Number is always that Rational Number.

$0 + \frac{-5}{7} = \frac{-5}{7}$

$1.3 + 0 = 1.3$

C. Complete the following by putting the correct answer in the $\square$.

1. $1 \times \frac{+7}{9} = \square$

2. $\square \times 1 = \frac{-3}{11}$

3. $-3.5 \times \square = -3.5$

4. $0 \times 1 = \square$

5. $\frac{-6}{13} \times 1 = \square$

REMEMBER:

One times any Rational Number is that Rational Number

$\frac{+2}{3} \times 1 = \frac{2}{3}$

$1 \times -3.2 = -3.2$

HOWEVER,

One times any Rational Number is that number unless the Rational Number is zero. $1 \times 0 = 0$

D.

HIDDEN GAME

1. Work each problem below.
2. Find the correct answer in the rectangle at the bottom of the page.
3. Cross out the letter beside the correct answer.
4. Question 1 is done for you.

1. $1.63 \times 1 = 1.63$
2. $\frac{-3}{5} + 0 =$
3. $0 \times \frac{+5}{18} =$
4. $8\frac{2}{5} \times 1 =$
5. $1 \times {}^{-}1\frac{2}{3} =$
6. $0 \times 1 + \frac{2}{3} =$
7. $(1 \times \frac{-3}{8}) + (2.5 \times 0) =$
8. $(-3.6 + 0) \times 1 =$
9. $-6.32 + 0 =$
10. $\frac{2}{2} \times \frac{17}{3} =$
11. $\frac{0}{6} + \frac{-5}{7} =$
12. $\frac{16}{16} \times -2.3 =$

REMEMBER:

1. $\frac{-2}{13} \times 1 = \frac{-2}{13}$
2. $0 + -2.31 = -2.31$
3. Zero times any number is zero.
$6 \times 0 = 0$

H	~~B~~	S	T	O	Q	W	D	C	U	J	X	A	K	V	E	N	Y
$7\frac{5}{11}$	1.63	$8\frac{2}{5}$	$\frac{-5}{7}$	1	$\frac{-3}{8}$	$\frac{17}{3}$	0	-25	-2.3	$-1\frac{2}{3}$	-6.32	$\frac{2}{3}$	$\frac{5}{8}$	$\frac{-3}{5}$	3.7	-3.6	$\frac{-7}{9}$

EXERCISES: UNIT IV OBJECTIVE NO. B-12

A. Converting fractions to decimals:

Example: $\frac{3}{4}$ means $3 \div 4$ or $4\overline{)3}$

1. $\frac{5}{8}$ means $5 \div \square$ or $8\overline{)5}$
2. $\frac{2}{4}$ means $2 \div 4$ or $\square\overline{)2}$
3. $\frac{2}{5}$ means $\square \div 5$ or $\square$
4. $\frac{4}{5}$ means $\square \div \square$ or $\square$

NOTICE !

In each fraction the numerator is divided by the denominator. That is what we do to convert fractions to decimals.

B. Dividing the numerator by the denominator.

Examples: $\frac{3}{4}$ means

$$\begin{array}{r} 0.75 \\ 4\overline{)3.00} \\ \underline{2\ 8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

Notice. The decimal in the answer is placed just above the decimal in the numerator.

Notice. The decimal comes after the numerator.

$\frac{1}{8}$ means

$$\begin{array}{r} 0.125 \\ 8\overline{)1.000} \\ \underline{8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

$\frac{7}{4}$ means

$$\begin{array}{r} 1.75 \\ 4\overline{)7.00} \\ \underline{4} \\ 30 \\ \underline{28} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

1. $\frac{5}{8}$ means $8\overline{)5.0}$
2. $\frac{2}{4}$ means $4\overline{)2}$
3. $\frac{2}{5}$ means $5\overline{)2}$
4. $\frac{9}{2}$ means $2\overline{)9}$

C. Convert the following fractions to decimals.

1. $\frac{3}{5}$
2. $\frac{1}{4}$
3. $\frac{3}{10}$
4. $\frac{7}{20}$
5. $\frac{7}{2}$
6. $\frac{9}{4}$
7. $\frac{37}{100}$
8. $\frac{23}{1\ 000}$
9. $\frac{11}{5}$
10. $\frac{129}{250}$

REMEMBER !

To convert a fraction to a decimal, divide the numerator by the denominator.

D. Examples:

Decimal	Equivalent Fractions
0.6 means six tenths or	$\frac{6}{10}$
3.4 means three and four tenths	$3\frac{4}{10}$
0.07 means seven hundredths or	$\frac{7}{100}$
4.72 means four and seventy two hundredths	$4\frac{72}{100}$
or four hundred and seventy two hundredths	$\frac{472}{100}$
0.004 means four thousandths or	$\frac{4}{1\ 000}$
2.312 means two and three hundred and twelve thousands or two thousand three hundred	$2\frac{312}{1\ 000}$

NOTICE !

If there is one digit after the decimal point then the denominator of the equivalent fraction is ten.

NOTICE !

If there are two digits after the decimal point then the denominator of the equivalent fractions is 100.

NOTICE !

If there are three digits after the decimal point then the denominator of the equivalent fraction is 1 000.

1. Complete the following table. The first decimal is converted as an example.

DECIMAL	NUMBER OF DIGITS AFTER THE DECIMAL POINT	DENOMINATOR TO BE USED	EQUIVALENT FRACTION
0.009	3	1 000	$\frac{9}{1\ 000}$
0.41	2		$\frac{41}{\quad}$
0.3			$\frac{3}{\quad}$
0.07			______
5.2			$\frac{52}{\quad}$
4.75			______
2.031			______

2. Complete the following table. The first number is done for you.

Decimal	Meaning	Equivalent Fraction	Reduced Fraction
a. 0.8	eight tenths	$\frac{8}{10}$	$\frac{4}{5}$
b. 0.04			
c. 0.003			
d. 5.4			
e. 9.75			
f. 0.320			
g. 0.81			
h. 3.102			
i. 0.23			
j. 0.406			

Fractions can be reduced to lowest terms whenever possible.

E.

Discover the Hidden Message

Directions: Convert the decimals in the left column to fractions and find your answer in the answer column. The number in front of the answer tells you where to put the letter in the code at the bottom of the page.

S	0.60
H	3.2
A	5.05
P	0.002
T	9.014
E	15.5
C	0.75
D	0.03
O	0.3
A	0.7
V	1.2
E	3.01
L	0.52
I	22.4
M	3.004
A	2.41
N	0.61
I	1.95

1. $\frac{3}{100}$
2. $\frac{155}{10}$ or $\frac{31}{2}$
3. $\frac{75}{100}$ or $\frac{3}{4}$
4. $\frac{224}{10}$ or $\frac{112}{5}$
5. $\frac{3\ 004}{1\ 000}$ or $\frac{751}{250}$
6. $\frac{505}{100}$ or $\frac{101}{20}$
7. $\frac{52}{100}$ or $\frac{13}{25}$
8. $\frac{60}{100}$ or $\frac{3}{5}$
9. $\frac{32}{10}$ or $\frac{16}{5}$
10. $\frac{7}{10}$
11. $\frac{12}{10}$ or $\frac{6}{5}$
12. $\frac{301}{100}$
13. $\frac{241}{100}$
14. $\frac{2}{1\ 000}$ or $\frac{1}{500}$
15. $\frac{3}{10}$
16. $\frac{195}{100}$ or $\frac{39}{20}$
17. $\frac{61}{100}$
18. $\frac{9\ 014}{1\ 000}$ or $\frac{4\ 507}{500}$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

F.

FIND THE BINGO

Directions: Convert any of the following fractions to decimals and find your answer in the bingo box below. Circle your answer. Keep working problems in any order until you have five circled answers in a line - horizontally, vertically, or diagonally. When you find the bingo, your work is finished.

$\frac{1}{2}$ $\frac{3}{5}$ $\frac{3}{25}$ $\frac{7}{20}$ $\frac{13}{50}$

$\frac{3}{8}$ $\frac{17}{20}$ $\frac{12}{25}$ $\frac{7}{10}$ $\frac{1}{5}$

$\frac{1}{4}$ $\frac{1}{8}$ $\frac{4}{5}$ $\frac{3}{4}$ $\frac{3}{100}$

0.125	0.25	0.32	0.03	0.15
0.8	0.48	0.5	0.6	0.412
0.126	0.21	0.12	0.84	0.375
0.535	0.7	0.9	0.75	0.16
0.2	0.85	0.35	0.72	0.26

EXERCISES: UNIT IV OBJECTIVE NO. B-14

ATTENTION ! OBEY ALL NEW SIGNS

$<$	$>$	$=$
Less than	Greater than	Equal to

Remember this!

These are the same signs we used to compare integers. Let's see if you can remember how to use them:

a. $^{+}5 < {}^{+}11$

b. $^{-}2 > {}^{-}4$

c. $^{-}3 = {}^{-}3$

A. Comparing rational numbers in the form $\frac{a}{b}$.

1. Observe the following marks made on a test. After each one, write a fraction which represents that mark.

   a. 6 correct answers out of 10 questions ________.

   b. 9 correct answers out of 10 questions ________.

   c. 4 correct answers out of 10 questions ________.

   d. Which fraction above would give the highest mark? ________.

   e. The second highest mark would be ________.

   f. The lowest mark would be ________.

2. Now let's compare the fraction in (1.) by using signs.

   a. $\frac{9}{10} > \frac{6}{10}$ b. $\frac{4}{10} < \frac{6}{10}$ c. $\frac{6}{10} > \frac{4}{10}$

Notice: Because the denominators are the same, we only have to compare the numerators to tell which fraction is bigger.

3. Using the fractions $\frac{2}{8}$, $\frac{7}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{1}{8}$, complete the following exercise.

a. $\frac{2}{8} \square \frac{1}{8}$ b. $\frac{4}{8} \square \frac{7}{8}$ c. $\frac{5}{8} \square \frac{5}{8}$ d. $\frac{5}{8} \square \frac{4}{8}$ e. $\frac{1}{8} =$ ____ $\frac{5}{8} <$ ____

You can see how easy it is to compare fractions when they have common denominators. Therefore, in the future we will change all fractions to common denominators before we compare them.

4. Compare the following fractions using <, > or =. Observe the examples carefully.

IMPORTANT:

You must change the fractions so that they have a common denominator first.

Examples:

a. $\frac{3}{5} \square \frac{2}{3} = \frac{9}{15} \square \frac{10}{15}$

$\frac{9}{15}$ is less than $\frac{10}{15}$ because 9 is less than 10

b. $\frac{3}{8} \square \frac{-3}{4} = \frac{3}{8} \square \frac{-6}{8}$

$\frac{3}{8}$ is greater than $\frac{-6}{8}$ because 3 is greater than $^{-}6$.

c. $\frac{-4}{5} \square \frac{-8}{10} = \frac{8}{10} \square \frac{-8}{10}$

$\frac{-8}{10}$ equals $\frac{-8}{10}$ because $^{-}8$ equals $^{-}8$.

a. $\frac{1}{3} \square \frac{2}{6} = \bigcirc \square \frac{2}{6}$

b. $\frac{5}{10} \square \frac{2}{5} = \frac{5}{10} \square \bigcirc$

c. $\frac{-3}{4} \square \frac{-1}{2} = \frac{-3}{4} \square \bigcirc$

d. $\frac{-3}{4} \square \frac{-2}{3} = \bigcirc \square \bigcirc$

e. $\frac{9}{10} \square \frac{-4}{5} = \bigcirc \square \bigcirc$

Do not put in your signs until you have changed the fractions to a common denominator on this side.

REMINDER:

A negative rational is less than a positive rationa

$\frac{-3}{5} < \frac{2}{3}$

5. Now compare the following fractions yourself.

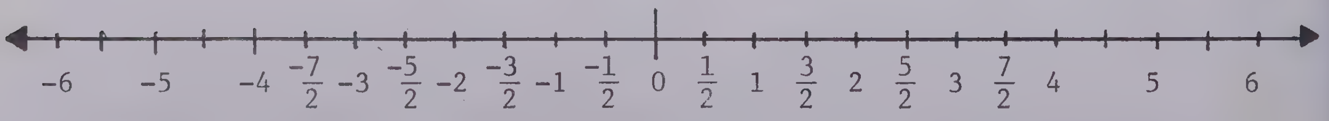
a. $\frac{2}{4} \square \frac{-3}{4}$

b. $\frac{5}{6} \square \frac{1}{3}$

c. $\frac{-8}{10} \square \frac{-4}{5}$

d. $\frac{-5}{12} \square \frac{-1}{4}$

e. $\frac{18}{30} \square \frac{6}{10}$



If a rational number is to the left of another rational number on a number lin it is less than the rational number to the right of it.

$\frac{-5}{2} < \frac{-3}{2}$ because $\frac{-5}{2}$ is to the left of $\frac{-3}{2}$ on a number line.

B. Comparing Rational Numbers in Decimal Form:

1. *You have learned earlier how to change fractions in decimal form to fractions in the form $\frac{a}{b}$. Therefore, when we compare rational numbers in decimal form we will change them into the form $\frac{a}{b}$ first.*

Examples:

a. $0.4 \;\square\; 0.5 \Longrightarrow \frac{4}{10} \boxed{<} \frac{5}{10}$

b. $-0.25 \;\square\; -0.30 \Longrightarrow \frac{-25}{100} \boxed{>} \frac{-30}{100}$

c. $0.62 \;\square\; 0.6 \Longrightarrow \frac{62}{100} \boxed{<} \frac{60}{100}$

NOTICE:

In (c), 0.6 actually means $\frac{6}{10}$ but we must change it to $\frac{60}{100}$ so that we have a common denominator.

2. Compare the following rational numbers.

a. $0.3 \;\square\; 0.25$

b. $0.8 \;\square\; 0.08$

c. $-0.45 \;\square\; 0.5$

d. $0.64 \;\square\; 0.640$

e. $-0.725 \;\square\; -0.8$

f. $0.32 \;\square\; -0.01$

g. $0.2 \;\square\; \frac{1}{5}$

h. $\frac{3}{4} \;\square\; -0.65$

i. $\frac{-1}{4} \;\square\; -0.25$

j. $0.5 \;\square\; \frac{11}{20}$

C. *What did the little girl say when she looked in the fridge and saw nothing there?*

1. To answer this riddle follow these instructions:

   a. First, complete all exercises by correctly putting a <, > or = sign between each pair of rational numbers.

   b. Then cross out the letters of all exercises which have < or = signs. There should be 14.

   c. The remaining letters, in order from top to bottom, will answer the above riddle.

V $\frac{5}{6}$ ○ $\frac{10}{12}$

O $\frac{3}{4}$ ○ $\frac{5}{8}$

L $\frac{-2}{3}$ ○ $\frac{-1}{3}$

I $\frac{-1}{3}$ ○ $\frac{-1}{2}$

B 0.4 ○ 0.55

Y 0.6 ○ $\frac{3}{5}$

C 0.22 ○ $\frac{1}{5}$

X -0.4 ○ -0.3

E $\frac{-3}{12}$ ○ $\frac{-6}{24}$

S -0.5 ○ $\frac{-4}{8}$

U $\frac{9}{10}$ ○ $\frac{8}{9}$

Q -0.15 ○ 0.1

R 0.854 ○ 0.85

P $\frac{-4}{5}$ ○ $\frac{-4}{6}$

N $\frac{6}{8}$ ○ 0.75

A 0.05 ○ 0.5

M 0.28 ○ -0.3

G 0.600 ○ 0.6

W $\frac{-1}{4}$ ○ $\frac{1}{4}$

T 0 ○ $\frac{-1}{2}$

A. Evaluate the expressions below by substituting for the variable.

1. If x = 2, find the value of x + 5

$x + 5$

$(\ ) + 5$ B

$(2) + 5$ S

$= 7$ C

The BSC Rule:

B - put brackets in place of each letter.

S - inside the brackets, substitute the number for the letter.

C - calculate the value of the expression.

Try the following using the BSC rule:

2. If x = 3, find the value of x - 6

3. If x = -2, find the value of x + 5

4. If x = 4, find the value of 2x + 5

5. If $x = -3$, find the value of $3x - 6$

Now try the following - Remember the BSC Rule

6. If $x = 2$, and $y = 4$, find the value of $4x + 2y$

$4x + 2y$

$4() + 2()$ B

$4(2) + 2(4)$ S

$8 + 8$

$= 16$ C

B - Brackets
S - Substitution
C - Calculate

7. If $x = 3$, and $y = 2$, find the value of $2x - 3y$

8. If $x = -3$, and $y = -4$, calculate the value of $2x - 3y$

9. If $x = 1$, and $y = 2$, and $a = -1$, find the value of $x - 2y + a$

10. If $x = -2$, and $y = -3$, find the value of $4xy$

B. Evaluate the expressions below by substituting for the variable.

1. If $x = 2$, $y = -3$ and $a = -1$, find the value of $x^2 - 3y^2 - 5a$

Solution

$x^2 - 3y^2 - 5a$

$()^2 - 3()^2 - 5()$ B

$(2)^2 - 3(-3)^2 - 5(-1)$ S

$= 4 - 3(-3) - 5(-1)$ C

$= 4 - 3(9) + 6$

$= 4 - 27 + 6$

$= -17$

Don't forget the exponents!

REMEMBER !

1. Put brackets in place of every letter or variable in the expression, for example:
   $()^2 - 3()^2 - 5()$
2. Between each set of brackets place the number assigned to that letter:
   $(2)^2 - 3(-3)^2 - 5(-1)$
3. Then find the value of the expression by clearing off brackets and adding:
   $= 4 - 3(9) + 6$
   $= 4 - 27 + 6$
   $= -17$

DON'T FORGET

$5(-6)^2 = 5(36)$

$= 180$

Square the -6 before you multiply by 5

Now complete and evaluate the following:

2. If $x = 2$, find the value of $x^2 + 7$

Solution

$$x^2 + 7$$
$$()^2 + 7$$

3. Find the value of $x^2 - y^2$ if $x = 2$ and $y = -3$

Solution

$x^2 - y^3$

$()^2 - ()^3$

$= \quad - ()$

$=$

REMEMBER...
Your exponents and the BSC.

4. If $x = -3$ find the value of $x + 3 - 3x - 4$

Solution

$x + 3 - 2x - 4$

$() + 3 - 2() - 4$

$=$

$=$

REMEMBER!
Square and cube the number first.

5. Evaluate $14 - (k - 2)$ if $k = -1$

Solution

$14 - \left[() - 2\right]$

$14 - \left[\quad\quad\right]$

$=$

$=$

6. Evaluate $\frac{2c - 4}{c + 1}$ if $c = -3$

Clear inside brackets first.

Solution

$$\frac{2\,() - 4}{() + 1} \quad =$$

7. xya^2 if $x = -2$, $y = 3$, and $a = -5$

Solution

$(\,)\ (\,)\ (\,)^2$

=

=

8. Evaluate $\frac{3y}{y - 4}$ if $y = 3$

Solution

9. Evaluate $6y^2 + 3y^2$ if $y = \frac{+2}{3}$

Solution

$6(\,)^2 + 3(\,)^2$

$6(\frac{2}{3})^2 + 3(\frac{2}{3})^2$

$= {}^{2}\cancel{6}(\frac{4}{\cancel{9}_{3}}) + {}^{1}\cancel{3}(\frac{4}{\cancel{9}_{3}})$

$= \frac{8}{3} + \frac{4}{3}$

$= \frac{12}{3}$

$= 4$

B - Brackets

S - Substitution

C - Calculate ...square and cancel make sure you have a common denominator. Add and simplify.

10. Evaluate $2s^2 - 5s^2$ if $s = \frac{-1}{2}$

Solution:

$2(\,)^2 - 5(\,)^2$

=

=

=

=

11. Evaluate $3x^2 - 5x + 0.8$ if $x = 0.5$

$3()^2 - 5() + 0.8$

$3() - \quad +$

$=$

$=$

Try the next 5 questions on your own.

12. Evaluate $\frac{2}{3}a + \frac{2}{5}b$ if $a = 3$ and $b = -5$

13. Evaluate $6x^3 - 5x^2 + 7x - 7$ if $x = 2$

14. Evaluate $\dfrac{3x^2 - 5y^2}{2x - y^3}$ if $x = -2$ and $y = -1$

15. Evaluate $3a - \left[2a^2 - 6\right]$ if $a = -4$

16. Evaluate $7x - 5y$ if $x = \frac{2}{3}$ and $y = \frac{1}{2}$

C. *What is the message ???*

1. Each of the two blocks below is divided into 12 boxes.
2. Boxes in Block I contain expressions.
3. Evaluate each expression in Block I and find your answer in Block II.
4. Write the work from the Block I box in the Block II box that has the correct answer.
5. Keep working until you find the message.

BLOCK I

If $x = 2$ then $x + 5 = ?$ Forget	If $x = -1$ and $y = 3$, then $x^2 - y^2 = ?$ You	If $a = 2$, $b = -2$ and $c = -3$, then $a + b - c = ?$ Math	If $a = -3$ $\frac{3a - 5}{2a - 1} = ?$ Mind
If $k = 0.3$ Then $k^3 - k = ?$ Your	If $x = 2$ and $y = -3$ $\frac{x}{y} =$ And	If $x = -5$ Then $10 - (x-2) = ?$ It	If $x = -2$ then $x^2 + 3x - 5 = ?$ A
If $x = -2$ then $\frac{3x}{x - 5} = ?$ Is	If $x = \frac{-3}{5}$ and $y = \frac{-1}{2}$ then $-5x + 6y = ?$ Challenge	If $a = \frac{1}{3}$ and $b = \frac{1}{2}$ $1\frac{1}{2} a + 2\frac{1}{3} b = ?$ To	If $t = 1.5$ $2t^2 = ?$ Don't

BLOCK II

3	$\frac{6}{7}$	-7	0
$\frac{5}{3}$	-0.273	2	$\frac{-2}{3}$
4.5	-8	7	17

A. Observe the following examples.

1. $^+3 = {}^+3$ - This is a true statement

$^+3 + \textcircled{$^+5$} = {}^+3 + \textcircled{$^+5$}$ - $^+5$ was added to both sides of the equality.

$^+8 = {}^+8$ - The sums on each side of the equal sign are still equal.

2. $^-2 = {}^-2$

$^-2 + \textcircled{$^-3$} = {}^-2 + \textcircled{$^-3$}$ - Again we started with two equal numbers and after adding the same number to both sides the sums were still equal.

$^-5 = {}^-5$

3. Now let's try an inequality.

$^+5 < {}^+9$ - This is a true statement

$^+5 + \textcircled{$^-4$} < {}^+9 + \textcircled{$^-4$}$ - 4 was added to each side.

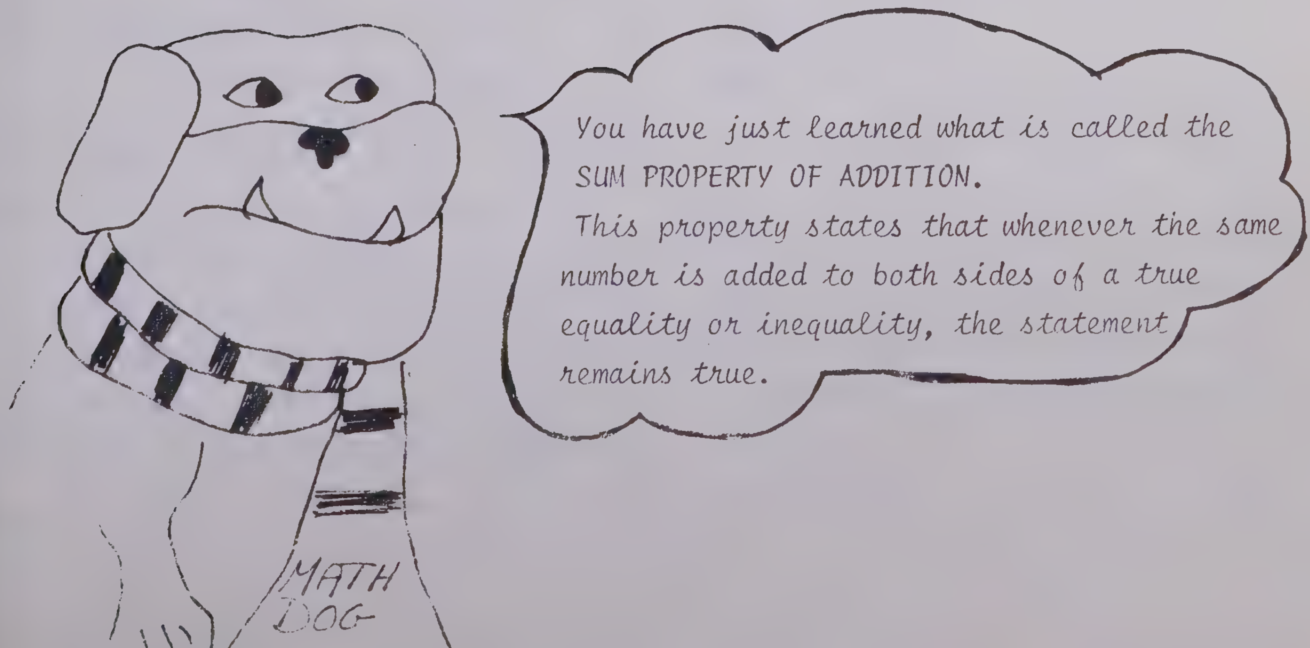
$+1 < +5$ This is still a true statement

4. One more ! !

$^-4 > {}^-6$ ---- Is this a true statement? ______________

$^-4 + \textcircled{$^-2$} > {}^-6 + \textcircled{$^-2$}$--- What was added to both sides? _________

$^-6 > {}^-8$ ---- Is this statement still true? _________



You have just learned what is called the SUM PROPERTY OF ADDITION.
This property states that whenever the same number is added to both sides of a true equality or inequality, the statement remains true.

5. Below are some true statements comparing two numbers. Follow the headings and complete the chart. The first one is done for you.

TRUE STATEMENT	ADD TO BOTH SIDES	NEW STATEMENT	TRUE OR FALSE
1. $^{+}8 > ^{+}3$	$^{-}3$	$^{+}5 > 0$	True
2. $^{+}2 > ^{-}4$	$^{-}5$		
3. $^{-}3 > ^{-}6$	$^{+}6$		
4. $^{-}10 < ^{-}7$	$^{+}5$		
5. $^{+}12 < ^{+}15$	$^{-}13$		
6. $^{-}6 = ^{-}6$	$^{+}5$		

B. Now let's examine what happens if we multiply both sides of a true statement by the same number.

1. a. $^{+}3 < ^{+}7$ A true statement

$^{+}3 \times (^{+}2) < ^{+}7 \times (^{+}2)$ - Multiply both sides by $^{+}2$.

$^{+}6 < ^{+}14$ This is still a true statement

b. $^{-}1 > ^{-}6$ A true statement

$^{-}1 \times (^{+}3) > ^{-}6 \times (^{+}3)$ - Multiply by +3

$-3 > -18$ Still true

c. $^{-}5 = ^{-}5$ True

$^{-}5 \times (^{+}4) = ^{-}5 \times (^{+}4)$ Multiply by +4

$-20 = -20$ Still true

Notice that in the above examples we multiplied both sides of a true equality or inequality by a POSITIVE number. The final statement was still true. This property is called POSITIVE MULTIPLIER PROPERTY.

2. a. $^{+}3 < ^{+}7$ A true statement

$^{+}3 \times (^{-}2) < ^{+}7 \times (^{-}2)$ Multiply both side by $^{-}2$

$^{-}6 < ^{-}14$ This statement is now false.

$^{-}6 > ^{-}14$ If we reverse the inequality sign, the statement is true.

b. $^{-}1 > ^{-}6$ A true statement

$^{-}1 \times (^{-}3) > ^{-}6 \times (^{-}3)$ Multiply by -3

$+3 > +18$ This is false

$+3 < +18$ This is true.

c. $^{-}5 = ^{-}5$ True

$^{-}5 \times (^{-}4) = ^{-}5 \times (^{-}4)$ Multiply by -4

$+20 = +20$ True

Notice that in the above examples we multiplied both sides of a true equali or inequality by a NEGATIVE number. This made the inequalities false. To make them true we had to reverse the inequality sign. This property is called the NEGATIVE MULTIPLIER PROPERT

3. Complete the following table using the positive and negative multiplier properties. The first one is done for you.

	TRUE STATEMENT	MULTIPLIED BY	NEW STATEMENT	TRUE OR FALSE	IF FALSE MAKE TRUE
a.	${}^+3 = {}^+3$	${}^+6$	${}^+18 = {}^+18$	True	
b.	${}^-7 = {}^-7$	${}^-3$			
c.	${}^-4 < {}^-2$	${}^+2$			
d.	${}^+3 > {}^-6$	${}^-4$			
e.	${}^-4 > {}^-6$	${}^+7$			
f.	${}^+2 < {}^+7$	${}^-3$			
g.	${}^+6 > {}^-3$	${}^-2$			
h.	${}^-10 = {}^-10$	${}^-1$			
i.	${}^-4 < 0$	${}^-5$			
j.	${}^+1 > {}^-1$	${}^-8$			

C. By completing the questions below, you will be able to find the answer to the following riddle:

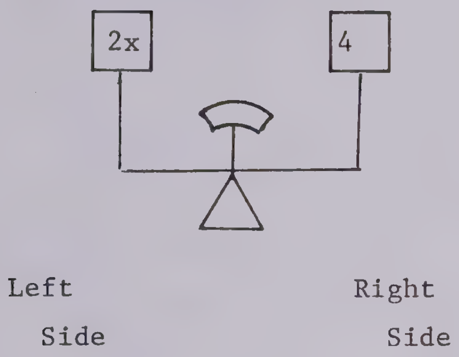
What do we call a person who can do wonders with numbers ?

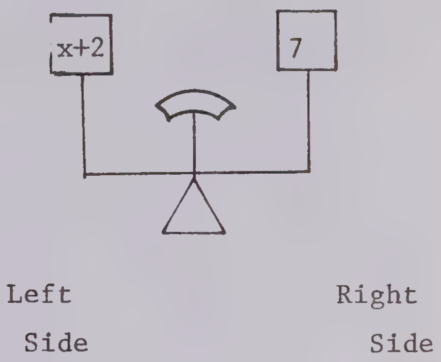
Answer the following questions by circling TRUE or FALSE.
Write the letter below the circle in the box which has the same number as that question.
The first one is done for you.

a.	If $^-4 = {}^-4$, then $^-4 \times {}^+2 = {}^-4 \times {}^+2$	$\frac{T}{G}$	$\frac{F}{S}$
b.	If $^+11 < {}^+20$, then $^+11 + {}^-4 = {}^+20 + {}^-4$	$\frac{T}{A}$	$\frac{F}{B}$
c.	If $0 > {}^-1$, then $0 + {}^+5 < {}^-1 + {}^+5$	$\frac{T}{C}$	$\frac{F}{M}$
d.	If $^-6 < {}^-2$, then $^-6 + {}^-8 < {}^-2 + {}^-8$	$\frac{T}{T}$	$\frac{F}{W}$
e.	If $^+5 = {}^+5$, then $^+5 \times {}^-4 = {}^+5 \times {}^-4$	$\frac{T}{M}$	$\frac{F}{R}$
f.	If $^-8 < {}^-2$, then $^-8 \times {}^-3 < {}^-2 \times {}^-3$	$\frac{T}{K}$	$\frac{F}{I}$
g.	If $^-25 > {}^+18$, then $^+25 \times {}^-8 < {}^+18 \times {}^-8$	$\frac{T}{H}$	$\frac{F}{O}$
h.	If $^-5 < {}^+5$, then $^-5 \times {}^+10 > {}^+5 \times {}^+10$	$\frac{T}{L}$	$\frac{F}{A}$
i.	If $^-7 < {}^-6$, then $^-7 + {}^-8 < {}^-6 + {}^-8$	$\frac{T}{I}$	$\frac{F}{T}$
j.	If $\frac{3}{4} = 0.75$, then $\frac{3}{4} \times \frac{-1}{2} = 0.75 \times \frac{-1}{2}$	$\frac{T}{A}$	$\frac{F}{O}$
k.	If $^-4 + {}^+4 = 0$, then $^-4 + {}^+4 + {}^-8 = 0 + {}^-8$	$\frac{T}{C}$	$\frac{F}{N}$
l.	If $^-5 \times {}^-4 > {}^+3 \times {}^-2$, then $^-5 \times {}^-4 \times {}^-1 > {}^+3 \times {}^-3 \times {}^-1$	$\frac{T}{A}$	$\frac{F}{N}$

5	2	4	7	▨	3	8	1	6	11	9	10	12
				▨			G					

A. 1. An equation can be compared to a balance where its left side is balanced by or is equal to its right side. For example:





2. An equation is also made up of terms, some terms having variables and others no variables.

For example in the equation $2x + 4 = 12$

term with variable terms without variables

Terms such as x and 3x or 2y and 5y which have the same variable raised to the same power or terms such as 4 and 12 having no variables, are also called like or similar terms.

3. Solving an equation means finding the value of the variable that will balance the equation.

For example, to solve

$$x + 4 = 6$$
$$x + 4 + {}^{-}4 = 6 + {}^{-}4$$
$$x + 0 = 2$$
$$x = 2$$

The term 4 must be removed from the left side. To do this, add its additive inverse to both sides of the equation .

REMEMBER:
Since an equation is like a balance whatever is done to one side must be done to the other side.

Fill in the rectangles in the following examples:

a. $x + 7 = 17$

$x + 7 + \boxed{{}^{-}7} = 17 + \boxed{{}^{-}}$

$x + 0 = \boxed{}$

$x = \boxed{}$

b. $x + 3 = 8$

$x + 3 + \boxed{} = 8 + \boxed{}$

$x + \boxed{} = \boxed{}$

$x = 5$

c. $x + {}^{-}5 = 9$

$x + {}^{-}5 + 5 = 9 + \boxed{}$

$x + 0 = \boxed{}$

$x = \boxed{}$

d. $x + \frac{2}{5} = \frac{3}{5}$

$x + \frac{2}{5} + \frac{-2}{5} = \frac{3}{5} + \boxed{{}^{-}\frac{}{}}$

$x + \boxed{} = \boxed{}$

$x = \boxed{}$

e. $n + 7 = 9$

f. $n + {}^{-}6 = 7$

g. $n + \frac{1}{2} = \frac{3}{4}$

h. $y + 1.2 = 2.2$

4. $3x = 15$

$\frac{1}{3}(3x) = \frac{1}{3}(15)$

$\frac{3x}{3} = \frac{15}{3}$

$1x = 5$

$x = 5$

> *To find the value of x multiply both sides of the equation by the reciprocal of 3.*

Fill in the blanks in the following examples.

a. $3x = 24$

$\frac{1}{3}(3x) = \boxed{}(24)$

$\frac{3x}{3} = \frac{24}{\boxed{}}$

$1x = \boxed{}$

$x = \boxed{}$

b. $6n = 30$

$\frac{1}{6}(6n) = \boxed{}(30)$

$\frac{6n}{6} = \boxed{}$

$1n = \boxed{}$

$n = \boxed{}$

c. $\frac{1}{9}n = 7$

$\frac{9}{1}\left(\frac{1}{9}n\right) = \square(7)$

$\frac{9n}{9n} = \square$

$1n = \square$

$n = \square$

d. $1.3\ y = 26$

$\frac{1}{1.3}(1.3y) = \square\ (26)$

$\frac{1.3y}{1.3y} = \frac{26}{\square}$

$1y = \square$

$y = \square$

Solve the following equations

e. $8x = 72$

f. $\frac{1}{3}\ x = 9$

g. $0.4a = 1.6$

h. $\frac{7}{5}z = 14$

5. $2x + 4 = 8$

$2x + 4 + {}^-4 = 8 + {}^-4$

$2x + 0 = 4$

$2x = 4$

$\frac{1}{2}(2x) = \frac{1}{2}(4)$

$\frac{2x}{2} = \frac{4}{2}$

$1x = 2$

$x = 2$

TWO STEP CONDITIONS:

Remove 4 from the left side by adding its additive inverse to both sides.

Multiply both sides by the reciprocal of 2.

Fill in the squares in the following examples:

a. $2m + 1 = 9$

$2m + 1 + \boxed{{}^-1} = 9 + \boxed{{}^-\ \ }$

$2m + 0 = 8$

$2m = 8$

$\frac{1}{2}(2m) = \square\, 8$

$\frac{2m}{2} = \frac{8}{\square}$

$1m = \square$

$m = \square$

b. $6n + {}^-4 = 8$

$6n + {}^-4 + \boxed{4} = 8 + \square$

$6n + 0 = \square$

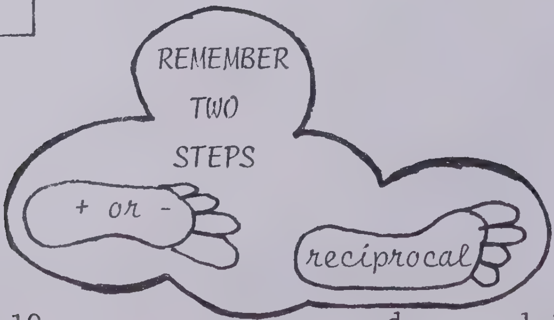
$6n = \square$

$\frac{1}{6}(6n) = \frac{1}{6}(\square)$

$\frac{6n}{6} = \frac{\square}{6}$

$1n = \square$

$n = \square$



c. $\frac{1}{4}x + 5 = 10$

$\frac{1}{4}x + 5 + \square = 10 + {}^-5$

$\frac{1}{4}x + 0 = 5$

$\frac{4}{1}(\frac{1}{4}x) = \square\ (5)$

$\frac{4x}{4} = \square$

$1x = \square$

$x = \square$

d. $1.2y + 0.3 = 3.9$

$1.2y + 0.3 + {}^-0.3 = 3.9 + \square$

$1.2y + 0 = 3.6$

$1.2y = 3.6$

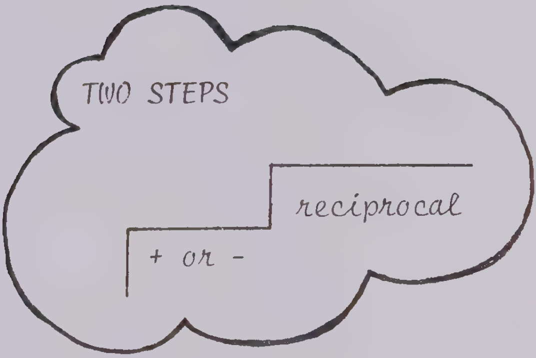
$\square(1.2y) = \square\ 3.6$

$1y = \square$

$y = \square$

e. $2t + 2 = 8$

f. $0.4x + 0.7 = 1.9$



g. $\frac{1}{4}a + 4 = 8$

6. $\frac{x}{2} = \frac{3}{4}$

$4x = 2(3)$

$4x = 6$

$\frac{1}{4}(4x) = \frac{1}{4}(6)$

$\frac{4x}{4} = \frac{6}{4}$

$1x = 1\frac{2}{4}$

$x = 1\frac{1}{2}$

Find the cross-products
THEN...
Multiply both sides of the equation by the reciprocal of 4

Complete the following examples by filling in the boxes.

a. $\frac{x}{3} = \frac{6}{2}$

$2x = 3(6)$

$2x = 18$

$\frac{1}{2}(2x) = \frac{1}{2}(\Box)$

$\frac{2x}{2} = \frac{\Box}{2}$

$1x = \Box$

$x = \Box$

b. $\frac{a}{6} = \frac{3}{9}$

$9a = 6(3)$

$9a = 18$

$\boxed{\frac{1}{9}}(9a) = \Box(18)$

$\frac{9a}{9} = \Box$

$1a = \Box$

$a = \Box$

c. $\frac{2x}{3} = \frac{4}{3}$

$2x(\Box) = 3(4)$

$6x = 12$

$\Box(6x) = \Box(12)$

$\Box = \Box$

$1x = \Box$

$x = \Box$

d. $\frac{x}{2} = \frac{1.2}{0.3}$

$0.3x = 2(\Box)$

$0.3x = 2.4$

$\frac{1}{3}(0.3x) = \Box(2.4)$

$\frac{0.3x}{0.3} = \Box$

$1x = \Box$

$x = \Box$

e. $3y + 2y = 15$

$5y = 15$

First combine all like terms $3y + 2y = 5y$

Then proceed as before.

f. $5x + {}^{-}2x = 21$

g. $-\frac{2}{3}a + \frac{4}{3}a = 11$

h. $\frac{2}{3}a + \frac{4}{3}a = 11$

7. To solve conditions of inequality use the same basic procedures as for equations.

EXAMPLES	FILL IN BOXES	SOLVE
a. $m + 4 > 26$	a. $n + {}^{-}3 < 15$	a. $p + 1.2 > 3.6$
$m + 4 + {}^{-}4 > 26 + {}^{-}4$	$n + {}^{-}3 + \square < 15 + \square$	
$m + 0 > 22$	$n + 0 < \square$	
$m > 22$	$n < \square$	
b. $3x > 27$	b. $\frac{5}{4} y < 15$	b. $1.5z > 6$
$\frac{1}{3}(3x) > \frac{1}{3}(27)$	$\frac{4}{5}(\frac{5}{4}y) < \square 15$	
$\frac{3x}{3} > \frac{27}{3}$	$\frac{20y}{20} < \frac{15}{\square}$	
$1x > 9$	$1y < \square$	
$x > 9$	$y < \square$	
c. $-2x < 14$	c. $\frac{1}{-2} y > 22$	c. $-1.1z < 44$
$-\frac{1}{2}(-2x) > \frac{1}{-2}(14)$	$\frac{-2}{1}(\frac{-1}{2}y) \square \frac{-2}{1}(22)$	
$\frac{-2x}{-2} > \frac{14}{-2}$	$\frac{2y}{2} \square \frac{-44}{1}$	
$1x > -7$	$1y \square -44$	
$x > -7$	$y \square -44$	
d. $3x + 2 < 13$	d. $\frac{3}{4}x + {}^{-}2 > 16$	d. $2.2x + 1.1 > 5.5$
$3x + 2 + {}^{-}2 < 13 + {}^{-}2$	$\frac{3}{4}x + {}^{-}2 + 2 > 16 + 2$	
$3x + 0 < 11$	$\frac{3}{4}x + 0 > 18$	
$3x < 11$	$\frac{3}{4}x > 18$	
$\frac{1}{3}(3x) < \frac{1}{3}(11)$	$\square(\frac{3}{4}x) > \square 18$	
$\frac{3x}{3} < \frac{11}{3}$	$\square x > \square$	
$1x < 3\frac{1}{3}$	$1x > \square$	
$x < 3\frac{1}{3}$	$x > \square$	

NOTICE:
Multiplying both sides by a negative reciprocal changes the direction of the inequality sign.

e. $-2x + 4 > 20$

$-2x + 4 + {}^{-}4 > 20 + {}^{-}4$

$-2x + 0 > 16$

$-2x > 16$

$\frac{1}{-2}\,(-2x) < \frac{1}{-2}\,(16)$

$\frac{-2x}{-2} < \frac{16}{2}$

$1x < -8$

$x < -8$

Remember:

Multiplying both sides by a negative reciprocal changes the direction of the inequality sign.

e. $-3x + 12 < 24$

$-3x + 12 + {}^{-}12 < 24 + {}^{-}12$

$3x + 0 < 12$

$-3x < 12$

$\frac{1}{-3}\,(-3x) \square \frac{1}{-3}\,(12)$

$\frac{-3x}{-3x} > \frac{12}{\square}$

$1x > \square$

$x > \square$

f. Solve:

$-4y + 3 > 19$

g. $\frac{x}{6} > \frac{4}{5}$

$5x > 6(4)$

$5x > 24$

$\frac{1}{5}(5x) > \frac{1}{5}(24)$

$\frac{5x}{5} > \frac{24}{5}$

$1x > 4\frac{4}{5}$

$x > 4\frac{4}{5}$

g. $\frac{y}{3} < \frac{6}{-7}$

$-7y < 3(6)$

$-7y < 18$

$\square(-7y) > \square(18)$

$\frac{-7y}{\square} > \frac{18}{\square}$

$1y > \square$

$y > \square$

g. $\frac{2y}{3} > \frac{1.2}{2}$

h. $5x + 3x > 24$

$(5 + 3)\,x > 24$

$8x > 24$

$\frac{1}{8}(8x) > \frac{1}{8}(24)$

$\frac{8x}{8} > \frac{24}{8}$

$1x > 3$

$x > 3$

h. $-4y + 2y < 12$

$(-4 + 2)y < 12$

$-2y < 12$

$\frac{1}{-2}\,(-2y) \square \frac{1}{-2}(12)$

$\frac{-2y}{-2} \square \frac{12}{2}$

$1y \square -6$

$y \square -6$

h. $6p + 20 > 32$

B. 1. Fill in the blanks under each column by choosing the proper term(s) from the given equations. The first number is done for you.

EQUATION	COLUMN A term(s) with variables	COLUMN B Term(s) without varia
a. $12m = 48$	12m	48
b. $\frac{5}{4}x = 20$	____	____
c. $x + {}^{-}3 = 9$	____	____, ____
d. $\frac{3}{4} + x = \frac{11}{12}$	____	____, ____
e. $3x + 5x = 24$	____, ____	____
f. $0.3x + 0.4x = 1.4$	____, ____	____
g. $\frac{3x}{8} = \frac{9}{2}$	____	____
h. $\frac{-2y}{3} = \frac{6}{1}$	____	____
i. $5\frac{1}{3}y + {}^{-}1 = 31$	____	____, ____
j. $5x + 6 = 26$	____	____, ____

2. Choose the similar or like terms from the list below and write them in groups.

$2x,\ 4,\ 3y,\ \frac{1}{2},\ 5x,\ \frac{3}{4}y,\ 0.6,\ 0.7x,\ 0.4y,\ \frac{7}{8}$

REMEMBER:
Similar or like terms are terms without a variable or terms containing the same variables raised to the same power.

3. Combine the similar or like terms on either side of the equal sign in the following equations. The first one is done for you.

a. $4x + 3x = 14$
$7x = 14$

b. $x + 2 + {}^{-}2 = 8 + {}^{-}2$

c. $4x + 4 + {}^{-}4 = 20 + {}^{-}4$

d. $\frac{1}{4}y + \frac{3}{4}y = 6$

e. $0.2a + 0.3a = 10$

Combining means to add the similar term to produce one single term.

4. Solve and verify.

a. $2x = 26$

b. $3x = {}^{-}9$

c. $30 = 5t$

d. $-5x = 10$

e. ${}^{-}3 = {}^{-}3y$

f. $\frac{1}{2}x = 12$

g. $\frac{3}{2}m = 15$

h. $0.4m = 16.4$

i. $\frac{5}{4}y = 20$

j. $1.4y = 2.8$

k. $\frac{3}{4}x = 18$

l. $0.2m = 7$

Remember: Multiply both sides by the reciprocal of the number in front of the variable.

5. Solve and verify.

a. $x + {}^{-}3 = 10$

b. $x + 5 = 11$

c. $m + {}^{-}2 = 0$

d. $y + {}^{-}1.5 = 4.5$

e. $\frac{1}{2} + x = \frac{7}{12}$

f. $\frac{3}{15} = \frac{-1}{15} + x$

g. $w + {}^{-}3 = 0$

h. $1\frac{1}{2} + p = 4\frac{1}{6}$

i. $2.1 + x = 4.7$

j. $2.5 + y = 7.5$

k. $\frac{7}{2} = y + \frac{-3}{2}$

l. $12 + w = -4$

6. Solve and verify.

a. $4x + 6 = 26$

b. $3t + 5 = 20$

c. $\frac{1}{2}a + 4 = 8$

d. $4.4m + 2 = 10.8$

e. $\frac{2x}{7} + {}^{-}4 = 18$

f. ${}^{-}3y + {}^{-}3 = 9$

g. $0.4x + 0.3 = {}^{-}1.7$

h. $40x + 7 = {}^{-}33$

i. $\frac{1}{5}y + {}^{-}1 = 0$

j. $5a + 2 = 13$

Remember: To solve This type move the like terms to one side of the equation, combine them into a single term then multiply both sides by the reciprocal of the number in front of the variable.

7. Solve and verify.

a. $\frac{x}{2} = \frac{15}{6}$

b. $\frac{1}{4}x = \frac{9}{2}$

c. $\frac{1.2}{3} = \frac{n}{2}$

d. $\frac{-3m}{1} = \frac{6}{-2}$

e. $\frac{3}{5}x = \frac{-6}{5}$

f. $\frac{-2y}{3} = \frac{6}{1}$

g. $\frac{3t}{1.8} = \frac{2}{4}$

h. $\frac{-3x}{4} = \frac{9}{3}$

Remember:
To solve this type of equation, first cross multiply then multiply both sides of the equation by the reciprocal of the number in front of the variabl

8. Solve and verify.

a. $3x + 2x = 40$

b. $0.3x + 0.4x = 1.4$

c. $12x + 13x = 75$

d. $\frac{1}{2}x + \frac{1}{4}x = 15$

e. $-3y + 5y = 24$

f. $4.2y + {}^{-}2y = 6.6$

g. $13m + {}^{-}8m = 30$

h. $\frac{4}{7}y + \frac{-1}{7}y = 21$

REMEMBER:
To solve this type of equation, add the simi or like terms then multiply by the reciproca of the number in front of the variable.

9. Solve:

a. $2x < 8$

b. $-3y > 24$

c. $6x + 4 < 16$

d. $-2x + 3 > 15$

e. $x + 11 > 10$

f. $x + {}^{-}3 < 7$

g. $\frac{3x}{2} < \frac{9}{6}$

h. $2x + 7x < 27$

REMEMBER:
When multiplying both sides by a negative number, change the direction of the inequality sign.

C. FIND THE BINGO

Work the problems below in any order. Check the bingo square and if you find your answer there, circle it. When you have five circled answers in a line, horizontally, vertically, or diagonally, your work is finished.

$4x = 12$

$x + 4 = 6$

$\frac{1}{3}x + 4 = 11$

$7x + {}^{-}3x = 28$

$\frac{x}{2} = \frac{-12}{6}$

$5x + {}^{-}3 = {}^{-}13$

$x + 1.2 = 2.5$

$\frac{4x}{3} = \frac{-8}{2}$

$12x + 3x = 40$

$1.3x = 15.6$

$\frac{1}{7}x + 3 = 7$

$x + 4 = 17$

3	0.3	13	2.6	2
5	6	7	0.8	$2\frac{2}{3}$
-3	-4	-2	-6	$\frac{1}{4}$
10	-2.7	12	28	1.3
21	54	3.5	4	-11

$\frac{7}{6}x = 63$

$\frac{1.2}{3} = \frac{x}{2}$

$2x + 7x = 36$

$\frac{-2x}{3} = \frac{12}{3}$

$\frac{1}{3}x + \frac{5}{3}x = 12$

$x + 4.2 = 1.5$

$3x + 6 = 36$

$3.2x = 96$

$8x + {}^{-}5 = 35$

$x + \frac{1}{2} = \frac{3}{4}$

$2x = 5.2$

$\frac{x}{5} = \frac{1.4}{2}$

$5x + {}^{-}2x = -33$

Checking to see if my solution is correct is simple. All I do is substitute the solution number back into the original equation.

Right hand side (RHS)
Left hand side (LHS)

A. 1. $x + 2x = 9$ if $x = 3$

Wherever there is an x in the equation, you must substitute x with a 3.

example $x + 2x = 9$ The value of the RHS in this equation is fixed. It is 9.

$3 + 2(3) = 9$ Now substitute for x.

$3 + 6 = 9$ Work out the LHS of equation.

$9 = 9$ So now we know that x was in face equal to 3 because the left hand side (LHS) of the equation is equal to the right hand side (RHS).

2. $4x - 2 = 6$ $x = 2$

$4(2) - 2 = 6$

$8 - 2 = 6$

$6 = 6$ Correct.

Why is the value of x correct?

3. $5x + 7 = {}^-8$ $x = {}^-3$

$5(-3) + 7 = -8$

$-15 + 7 = -8$

$-8 = -8$

The LHS of the equation is equal to the RHS, therefore the solution is correct.

4. $3x + 4x = 35$ $x = -5$

$3(-5) + 4(-5) = 35$

$-15 + {}^-20 = 35$

$-35 = 35$ Wrong because ${}^-35$ is not equal to ${}^+35$

B. Now fill in the blanks with the correct numbers and see if the solution is correct.

1. $8x - 2 = 30 \qquad x = {}^{+}4$

$8(\quad) - 2 = 30$

$\square - 2 = 30$

$\square = \square$ ________

RHS is equal to 30.
What does the LHS equal to?

2. $\frac{1}{2}x + \frac{1}{3}x = \frac{-15}{24} \qquad x = \frac{-3}{4}$

$(\frac{1}{2} \times \frac{-3}{4}) + (\frac{1}{3} \times \frac{-3}{4}) = \frac{-15}{24}$

$\square + \square = \frac{-15}{24}$

$\square = \frac{-15}{24}$ ________

Write CORRECT or WRONG in each space opposite the last step.

3. $2x + 3x = 9 \qquad x = {}^{+}5$

$\square + \square = 9$

$\square = 9$ ________

4. $2x - 3 = 7 \qquad x = 5$

$2(\square) - 3 = 7$

$\square - 3 = 7$

$\square = \square$ ________

Does the LHS = RHS ?

5. $\frac{1}{4}x - \frac{2}{3} = 1\frac{3}{4} \qquad x = 9\frac{2}{3}$

$\frac{1}{4}(\square) - \frac{2}{3} = 1\frac{3}{4}$

$\square - \frac{2}{3} = 1\frac{3}{4}$

$\square = \square$ ________

6. $\frac{x}{3} = \frac{9}{6}$ $x = 6$

$\frac{\square}{3} = \frac{9}{\square}$

$\square = \frac{9}{6}$ ____________

7. $17 + 3x = 29 + 9x$ $x = {}^{-}2$

$17 + \square \times \square = 29 + 9(\square)$

$17 + \square = 29 + \square$

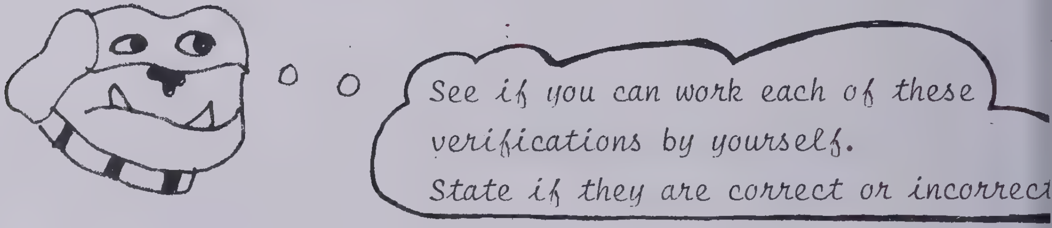
$\square = \square$ ____________

8. $14x = 2$ $x = \frac{-1}{7}$

$14(\square) = 2$

$\square = 2$ ____________

C.



See if you can work each of these verifications by yourself. State if they are correct or incorrect

1. $x + 4 = 7$ $x = {}^{-}3$

2. $y + 3 = 11$ $y = 8$

3. $t - 7 = 6$ $t = 13$

4. $\frac{3}{4} + x = \frac{11}{12}$ $x = \frac{1}{6}$

5. $\frac{3x}{6} - 1 = 1$ $x = 4$

6. $7x - 8 = 32 - 13x$ $x = 2$

7. ${}^{-}3x + 7 = 3x - 11$ $x = 3$

8. $\frac{x}{10} = \frac{100}{25}$ $x = 40$

D. Solve and verify each of these problems.
The first one is done for you.

1. $x + {}^{-}3 = 7$

$x + {}^{-}3 + {}^{+}3 = 7 + {}^{+}3$

$x = 10$

$x + {}^{-}3 = 7$

$10 + {}^{-}3 = 7$

$7 = 7$

LHS = RHS
therefore the solution for x is correct.
MATH DOG

2. $\frac{1}{2} + x = \frac{5}{6}$

3. $t - 4 = 11$

4. ${}^{-}5\frac{1}{3} + x = 8$

5. $4x + 7 = 31$

6. $\frac{3}{7}n - 4 = 5$

7. $-8x + 3 = 27$

8. $\frac{3x}{5} + 6 = 9$

9. $\frac{3x}{7} = \frac{30}{14}$

10. $\frac{-7x}{1} = \frac{10}{-2}$

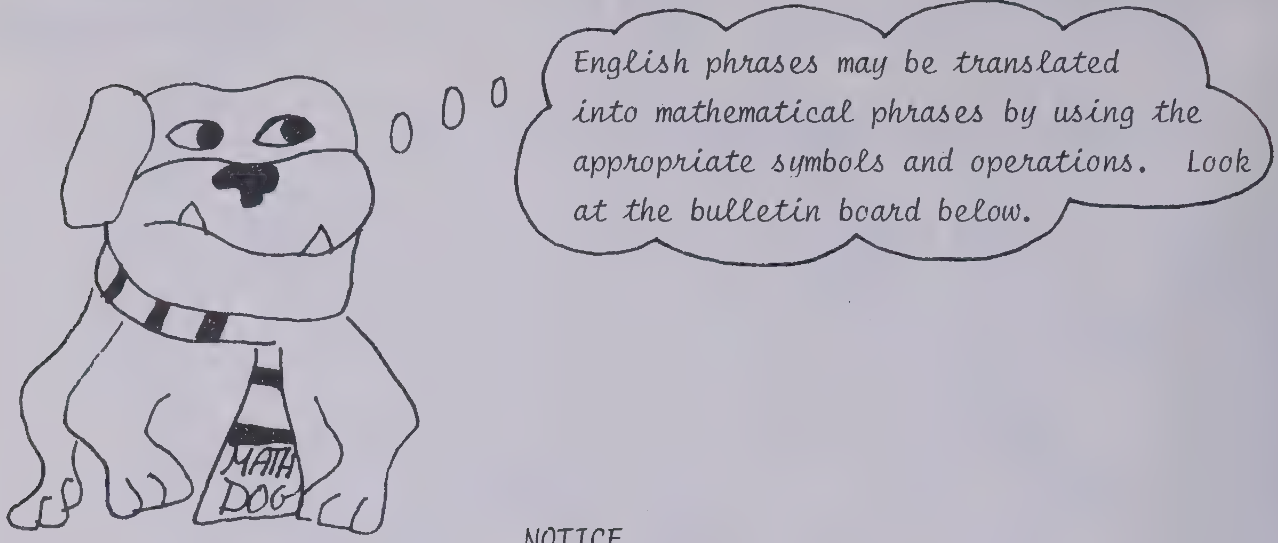
11. $4x + 2x = 42$

12. $\frac{4}{9}y - \frac{2}{9}y = 14$

13. $3(4x + 7) = 81$

14. $6x = 4x + 6$

15. $14 - 6x = 4x - 16$


English phrases may be translated into mathematical phrases by using the appropriate symbols and operations. Look at the bulletin board below.
MATH DOG

NOTICE

ENGLISH PHRASE	MATHEMATICAL SYMBOL
The sum of	+
added to	+
increased by	+
the difference of	-
subtracted from	-
decreased by	-
less than	-
the product of	x
times	x
of	x
divided by	÷
is equal to	=
equals	=
is	=
is less than	<
is more than	>
a number	use any letter

Now see if you can fill in the blanks with numbers, letters, or symbols in this short exercise. Write mathematical sentences.

A. 1. The sum of a number and 3 $n + 3$

2. The sum of 4 and a number $4 +$ ____

3. 7 is added to a number ____ ____ 7

4. A number is increased by 12 $n +$ ____

5. A number is increased by 5 ____ ____ 5

6. 13 is added to a number t____ 13

7. A number is added to 21 ____ ____n

8. 8 is subtracted from a number p ____ 8

9. 6 is subtracted from a number ____ ____6

10. 12 less than a number ____ ____ 12

11. 15 less than a number n ____ ____

12. a number is subtracted from 13 13 ____ ____

13. 11 is subtracted from a number ____ ____ 11

14. the product of 7 and a number $7 \times n$ or $7n$

15. Three times a number ____ ____ ____ or ____

16. $\frac{3}{4}$ of t $\frac{3}{4}t$

17. $\frac{7}{16}$ of a number ____ ____

18. $\frac{5}{8}$ of a number ____ ____

19. Four times a number is more than seven ____ ____ > 7

20. A number divided by 6 $\frac{n}{6}$ or $n \div 6$

21. A number divided by 15 ____ or ____ ____ ____

REMEMBER
Each blank
requires a
letter, number
or symbol.

22.	A number is equal to 14	$n = 14$
23.	Two times a number is 41	$2n = 41$
24.	Six times a number is 22	$6n =$ ___
25.	47 plus a number is 142	___+___=___
26.	115 less than n equals 6	___ ___ ___=6
27.	A number is less than 7	$n<7$
28.	Five times a number is less than 3	5 ___ ___ ___
29.	Six more than a number is less than 17	___ ___ ___< ___
30.	Twelve is decreased by n to give you 3	12___n ___ 3
31.	Eight is less than four times a number	___ < ___ ___
32.	If a number is doubled the result is twelve	___ ___ = 12
33.	Six more than a number is greater than fourteen.	___+___ ___ ___
34.	When a number is subtracted from four the result is six.	4 ___ ___=___
35.	Three times a number is less than the number decreased by four	$3n < n - 4$
36.	Six times a number is more than the number increased by three	___ ___ ___n + 3
37.	The sum of a number and $5\frac{1}{3}$ is three less than the number.	___ ___ ___ < n
38.	When three is subtracted from a number the result is five	n -___ = ___
39.	A number increased by four is less than 23	n ___ ___ ___23
40.	The sum of n and (3n - 2)	___ ___(3n - 2)
41.	Five times a number plus eight is greater than two times the number	5n + ___ > ___ ___
42.	Four less than twice a number is thirty one	___ ___-4 = ___
43.	Twenty-one is three more than four times a number	21 = ___ n + ___

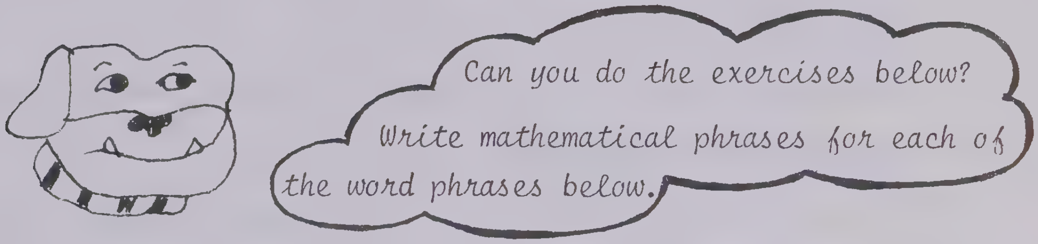
44. We get twelve when six is subtracted from a certain number ___ ___ ___ = 12

45. Jim's age three years from now (Let n be Jim's age) $n + 3$

46. Helen's age four years ago n ___ ___

47. Tom's age six years ago was nine ___ ___ ___ = 9

B.


Can you do the exercises below?
Write mathematical phrases for each of the word phrases below.

1. The sum of a number and eleven.
2. Six less than a number is four.
3. Two times a number is less than 3n.
4. Five more than three times a certain number.
5. The value of n chocolate bars if each bar is worth twenty cents.
6. Seven more than a number.
7. A certain number divided by six is more than eight.
8. One-third of a number is less than one half of a number.
9. If three times a certain number is subtracted from 18, the result is 15.
10. A certain number increased by four is seven.
11. The sum of nine and $n + 7$.
12. Twelve is decreased by a number and the result is four.
13. When a certain number is subtracted from twenty-seven the result is $^{-}8$.
14. Alice's age six years from now is twelve.
15. A certain number divided by one is equal to the number.

C. *Do you know what an* ATOMIC BOMB *is ?*

To find out, work each word problem and find the solution at the bottom of the page. The number in front of the answer tells you where to put the letter in the code.

O - A number plus eleven is two less than twice that number.

M - Five times a number is equal to twelve.

A - A certain number is less than five.

T - The product of four and a number is equal to 3 plus six times the number.

H - One less than a number is equal to four.

E - A certain number plus one half the number is equal to four.

N - A number divided by three is greater than a number divided by seven.

I - A number increased by nine is equal to three times the number.

L - A number decreased by five is equal to twelve.

G - Four is less than three times a number.

K - The product of two less than a number and four.

S - A number added to nine is greater than three times the number.

U - Five times a number is more than twelve.

F - Seven decreased by a certain number is equal to negative four.

1. $x + \frac{1}{2}x = 4$
2. $(x - 2) \times 4$
3. $x - 1 = 4$
4. $5x > 12$
5. $x + 9 = 3x$
6. $x + 11 = 2x - 2$
7. $x - 5 = 12$
8. $5x = 12$
9. $4 < 3x$
10. $x < 5$
11. $4x = 3 + 6x$
12. $7 - x = {}^{-}4$
13. $9 + x > 3x$
14. $\frac{x}{3} > \frac{x}{7}$

11 3 1   11 3 5 14 9   11 3 10 11

8 10 2 1 13   8 6 7 1   3 5 7 7 13

6 4 11   6 12   8 6 4 14 11 10 5 14 13

Follow each of the steps below to see how to solve a PROBLEM ABOUT NUMBERS. Here is the problem:

The sum of 23 and 5 times a number is 118.
FIND THE NUMBER.

STEP ONE:

Let n be the number.

Of course you can use another letter instead of n if you want to.

STEP TWO:

$5n + 23 = 118$

Write the mathematical statements from given word problems.

STEP THREE:

Solve the equation.

$$5n + 23 = 118$$

$$5n + 23 + {}^-23 = 118 + {}^-23$$

$$5n = 95$$

$$\frac{1}{5} \times 5n = 95 \times \frac{1}{5}$$

$$n = 19$$

STEP FOUR:

Verification.

This shows that your answer is correct

$$5n + 23 = 118$$

$$(5 \times 19) + 23 = 119$$

$$95 + 23 = 118$$

$$118 = 118$$

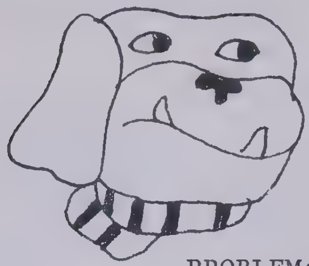
Remember:

To verify the unknown number with what you found n to be in the original equation.

STEP FIVE:

Read the question once more to see what it asked you to find.
Now answer it in a sentence.

The number is 19.



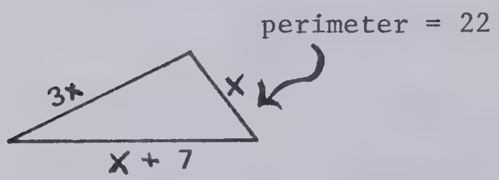
Sometimes you are asked GEOMETRY PROBLEMS. Follow the steps shown below to see how we solve these problems.

PROBLEM:

The length of the shortest side of a triangle is 7 cm shorter than the longest side. The third side is three times the length of the shortest side. The perimeter is 22 cm. Find the length of each side.

STEP ONE:

Draw a diagram to illustrate the problem.



REMEMBER:
Perimeter is the distance around a triangle.

STEP TWO:

Let x be the length of the shortest side.

Then x + 7 is the longest side.

And 3x is the length of the third side.

STEP THREE:

Write a mathematical statement

$x + 3x + (x + 7) = 22$

STEP FOUR:

Solve:

$x + 3x + (x + 7) = 22$

$5x + 7 = 22$

$5x + 7 + {}^{-}7 = 22$ -

$5x = 15$

$\frac{1}{5} \text{ x } 5x = 15$

$x = 3$

Remember if you add all the lengths of the sides you get the perimeter.

STEP FIVE: Verification

$x + 3x + x + 7 = 22$

$3 + 3(3) + 3 + 7 = 22$

$3 + 9 + 3 + 7 = 22$

$22 = 22$

Remember:
x was found to be 3, so substitute x with 3.
Therefore the answer must be correct

STEP SIX: Answer the question.

Look at Step Two: The three lengths were mentioned, they were $x = 3$

$3x = 9$

$x + 7 = 10$

The lengths of each side of the triangle are 3 cm, 10 cm, and 9 cm.

You will have to solve problems that deal with other matters other than geometry or just numbers. Study each step below to see how it is done.

PROBLEM:

Mrs. Brown, who teaches grade eight, is four years older than twice Tom's age. Their ages total to forty-six years. Find their ages.

STEP ONE:

Let x be Tom's age, and 2x + 4 is Mrs. Brown's age.

STEP TWO:

$$x + 2x + 4 = 46$$

REMEMBER:
Mathematical statement

Their ages totalled 46 years. So we must add their ages.

STEP THREE:

$$x + 2x + 4 = 46$$
$$3x + 4 = 46$$
$$3x + 4 + {}^-4 = 46 + {}^-4$$
$$3x = 42$$
$$\frac{1}{3} \times 3x = 42 \times \frac{1}{3}$$
$$x = 14$$

SOLVE

STEP FOUR:

Verification

$$x + 2x + 4 = 46$$
$$14 + 2(14) + 4 = 46$$
$$14 + 28 + 4 = 46$$
$$46 = 46$$ Correct

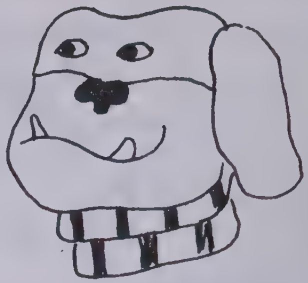
STEP FIVE:

What was the question?

Tom is 14 years old and Mrs. Brown is 32.

Now see if you can work these problems. All you have to do is fill in the blanks.

REMEMBER:
Look back at the instruction sheets for each step.



A. 1. A number is three more than a second number. The sum of the two numbers is 17. Find the numbers.

Solution:

STEP ONE: Let n be the second number

And n ___ ___ is the first number

Three more than the second number.

STEP TWO: Mathematical Statement

$n + n$ ___ ___ $= 17$

How do you find the sum?

STEP THREE: Solve

$n + n + 3 = 17$

$\underline{\quad\quad} + 3 = 17$

$2n + 3 + {}^{-}3 = 17 + {}^{-}3$

$2n = \underline{\quad\quad}$

$\frac{1}{2} \times 2n = 14 \times \frac{1}{2}$

$n = \underline{\quad\quad}$

Gather your like terms.
n + n = 2n

STEP FOUR:

Verify

$n + n + 3 = 17$

$\underline{\quad\quad} + \underline{\quad\quad} + 3 = 17$

$\underline{\quad\quad} + 3 = 17$

$\underline{\quad\quad} = 17$

Is it correct ?

STEP FIVE:

The numbers are ____ and _____.

Did you look back at Step One before answering ?

2. The sum of twelve and six times a certain number is 42.
   Find the number.

STEP ONE:

See if you can work this one by yourself.

STEP TWO:

STEP THREE:

Look back at some of the other problems to make certain you are working it correctly.

STEP FOUR:

STEP FIVE:

How was the last problem? Did you get five for the number? If you did, that is really good. Now try to work these two without any hints at all.

3. One number is eighteen less than a second number. Their sum is 48. Find both numbers. (Show all your work)

What is one of the numbers?
STEP ONE: Remember?

The two numbers are ______ and ________

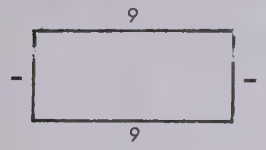
4. When six is subtracted from 8 times a certain number the result is ten. Find the number, and show all your work.

Six is subtracted from
8 times the number.

B. 1. The length of a rectangle is nine cm.
The perimeter is 28 cm. Find the width of the rectangle.

Solution:

STEP ONE: Diagram



What should you put for the width?

STEP TWO:

Let x be the ______.

STEP THREE:

$\_\_\_\_ + x + 9 + \_\_\_\_ = \_\_\_\_$

Perimeter is the distance around the rectangle.

STEP FOUR: Solve

$x + x + 9 + 9 = 28$

$\_\_\_ + \_\_\_ = 28$ Gather like terms.

$\_\_\_\_ + \_\_\_\_ + {}^{-}18 = 28 + \_\_\_\_$

$2x = \_\_\_\_$

$\frac{1}{2} \times 2x = \_\_\_\_ \times \frac{1}{2}$

$x = \_\_\_\_$

STEP FIVE:

Verify

$x + x + 9 + 9 = 28$

Substitute x for your answer.

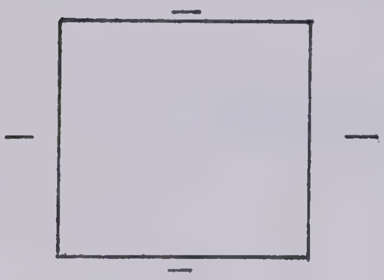
$\_\_\_\_ = 28$ Is it correct?

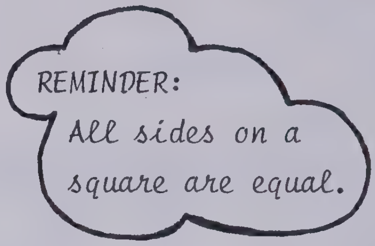
STEP SIX:

The rectangle is ______ wide.

2. A square has a perimeter of twenty-four inches. Find the length of one side.

STEP ONE: Diagram

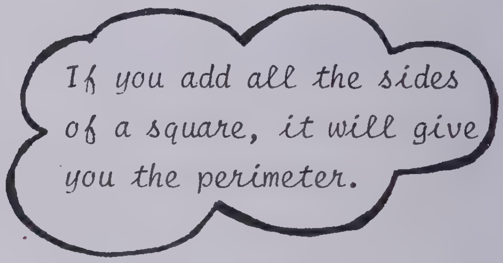



REMINDER:
All sides on a square are equal.

STEP TWO:

Let _____ be one side.

STEP THREE:


If you add all the sides of a square, it will give you the perimeter.

STEP FOUR:

STEP FIVE:

STEP SIX:

3. A rectangle is three times as long as it is wide.
If the perimeter is 32 cm, what is the length and the width?

DRAW A DIAGRAM!

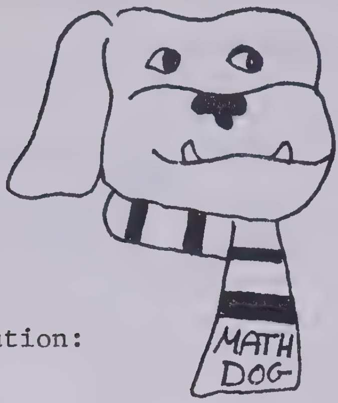
The length is ____ cm and the width is _____ cm.

4. The largest angle of a triangle is three times that of the smallest angle. The third angle is 72°. Find the measure of the smallest angle.

Remember that a triangle has a total of 180° in its three angles.

The sum of the angles of a triangle is 180°

C.



In a math class there are 29 pupils. There are five more girls than there are boys. How many girls and boys are there?

1. Solution:

STEP ONE:

Let ____ be the number of boys

and _____ be the number of girls.

STEP TWO AND STEP THREE:

$\_\_\_\_ + \_\_\_\_ = \_\_\_\_$

$2x + \_\_\_\_ = \_\_\_\_$

$2x + \_\_\_\_ + {}^{-}5 = 29 + {}^{-}5$

$2x = \_\_\_\_$

$\frac{1}{2} \times 2x = \_\_\_\_ \times \frac{1}{2}$

$x = \_\_\_\_$

Add the boys and girls to give the number of pupils.

STEP FOUR: Verify

$= 29$ ↶ Does this check out?

Refer to Step One.

STEP FIVE:

There are ______ boys and _______girls

2. Don bought a hockey stick and a pair of hockey gloves. He paid $1.73 less than four times the cost of the stick for his gloves. How much did he pay for the gloves and for the hockey stick if he spent $17.02 in all?

STEP ONE:

Let x be the cost of the stick

and 4x ___ 1.73 would be the cost of the gloves.

Less than. Should you add or subtract?

STEP TWO:

Equation or Mathematical Statement

Cost of gloves and stick should be equal to what he spent.

STEP THREE: Solution

STEP FOUR: Verify

Does it check out?

STEP FIVE:

The cost of the stick was _______ and the gloves cost __________

3. If a bottle containing one hundred aspirins costs $1.50, what is the cost of one aspirin?

REMINDER:
Ratio Problem

$$\frac{100}{150} = \frac{1}{x}$$

4. Bill made twice as many baskets as Henry did during the basketball season. In all, both boys made 168 baskets. How many baskets did each boy make?

What did you let x be?

EXERCISES: Cont'd UNIT IV OBJECTIVE NO. B-23

D.

CHAIN CODE

Work any problem and find your answer in the coded message at the bottom of the page. Each time the answer appears in the code, write the letter at the end of that problem above it.

1. The sum of 27 and 3 times a number is equal to 42. E
2. One number is 8 times larger than another number. Their sum is 63. Find that number. K
3. A number is 4 more than twice a second number and their sum is 22. Find the first number. A
4. Jane is half as old as her mother. Together their ages total 60 years. Find the mother's age. I
5. Two sides of a triangle have the same length. The third side is 2 metres shorter than the sum of the two equal sides. The perimeter is 10 metres. Find the length of one of the equal sides. R
6. Helen bought fifty litres of gas for $9.00. How much did she pay per litre? O
7. On a recent field trip 28 pupils spent a total of $13.16. How much on the average, did each one spend? S
8. The length of the longest side of a rectangle is 14 metres more than the shortest side. The perimeter is 60 metres. What is the length of the longest side? C
9. A square has a perimeter of 36 cm. Find the length of one side. M
10. The basketball team is going to spend $156 to go play in Red Deer. How much will each of the 12 members have to pay? L
11. There are twice as many boys as girls in our class of 33 pupils. How many girls ? T

A BRILLIANT DESSERT

___ 6 ___ 3 ___ 5 ___ 6 ___ 13 ___ 47 ___ 9 ___ 6 ___ 3 ___ 11

___ 8 ___ 18 ___ 18 ___ 7 ___ 40 ___ 5

RATINGO

Directions to Student:

1. Draw a 12 cm by 12 cm square and divide it into 16 equal squares.

2. a. Choose 16 rational numbers (all different) from the list below.

   b. Using the 16 rational numbers you have chosen, place them (one in each square) in the 16 squares you have drawn.

3. List of rational numbers to choose from:

6
-35
-10
14
$\frac{4}{5}$
8
4
9
-4
0
$\frac{7}{24}$
-5
$\frac{1}{2}$
7
$\frac{-3}{16}$
24
-7
1
$\frac{1}{3}$
-3
12
$2\frac{1}{4}$
$-4\frac{1}{2}$
-1
17
7.75
25
-28
24
10
-2
$-4\frac{4}{5}$
-17
$-7\frac{3}{5}$
$\frac{1}{4}$
$\frac{3}{4}$
$\frac{-15}{16}$
-14
-8
5

4. The teacher will show a flash card with a problem on one side.

5. Work out the problem.

6. If your answer is one of the 16 numbers you have chosen, put an X through the square containing the answer.

7. Decide with your teacher before you begin what squares must have an X in them in order for you to have a RATINGO .

RATINGO

For the teacher:

1. Prepare flash cards using the problems listed below.
2. Put the problem on one side and the answer on the opposite side.
3. Show the students a card and let them work out the problem. If the answer appears on their card they should place an X on that square.
4. Decide with the students before the game what will make a RATINGO.
5. The winner should be given some recognition such as a math button, funny prize, etc.
6. Problems to be placed on flash cards.

	PROBLEM	ANSWER
1.	$x^2 - 3$ if $x = -3$	6
2.	$n + 6$ if $n = 11$	17
3.	$^{-}20 - 4$	-24
4.	$19 - n = 12$	7
5.	$\frac{x}{2} = \frac{-50}{10}$	-10
6.	$y - {}^{-}25 = 50$	25
7.	$^{-}4 + n = {}^{-}4$	0
8.	$5(-4) + 3(4)$	-8
9.	$8({}^{-}10 + 11)$	8
10.	$^{-}15 \div {}^{-}3 =$	5
11.	$20 \div {}^{-}4 =$	-5
12.	$n \text{ x } {}^{-}9 = {}^{-}9$	1
13.	$^{-}3 - {}^{-}2$	-1
14.	$\frac{5}{x}(10) = 5$	10
15.	$2^3 - 2^2$	4

	PROBLEM	ANSWER
16.	16 - 18	-2
17.	-30 ÷ 10	-3
18.	-4(0.4 + 0.6)	-4
19.	if n = 2, what does n - 19 equal	-17
20.	$\frac{2x}{3} = 16$ x =	24
21.	$\frac{-1}{2} + \frac{3}{4} =$	$\frac{1}{4}$
22.	$\frac{3}{8}(x + 4)$ if $x = {}^{-}2$	$\frac{3}{4}$
23.	$(\frac{-1}{4})^2 - 1$	$-\frac{15}{16}$
24.	$\frac{12}{y} + 18$ if $y = {}^{-}3$	14
25.	$\frac{-1}{8} \div \frac{-1}{4}$	$\frac{1}{2}$
26.	(-9 + 2)5	-35
27.	$8 - x^2$ if $x = {}^{-}0.5$	7.75
28.	$y + y^2$ if $y = \frac{-1}{4}$	$-\frac{3}{16}$
29.	$3x^2 + 6x^2$ if $x = \frac{-1}{2}$	$2\frac{1}{4}$
30.	$3x + 5y + 8z$ if $x = {}^{-}3$, $y = 2$, $z = {}^{-}1$	-7
31.	$\frac{1}{2}m + \frac{1}{4}p$ if $m = {}^{-}5$, $p = {}^{-}8$	$-4\frac{1}{2}$
32.	$\frac{1}{2}x + \frac{1}{3}y$ if $x = \frac{1}{3}$, $y - \frac{1}{2}$	$\frac{1}{3}$
33.	$n + 10\frac{1}{2}$ if $n = -1\frac{1}{2}$	9
34.	$\frac{5}{6}x = -4$ x =	$-4\frac{4}{5}$
35.	15 + (x - 2) = 25	12
36.	${}^{-}4 + y$ if $y = {}^{-}10$	${}^{-}14$
37.	4(m - 6) if $m = {}^{-}1$	-28
38.	$\frac{2}{5} - (\frac{4}{5} \times 10)$	$-7\frac{3}{5}$
39.	$4 \times \frac{1}{2} \times \frac{2}{5}$	$\frac{4}{5}$
40.	$\frac{5}{8} + \frac{-4}{9} + \frac{1}{9}$	$\frac{7}{24}$

KEY TO EXERCISES

LEVEL 8

UNIT IV

RATIONAL NUMBERS

KEY TO EXERCISES

Objective No. A-1

A.
1. 14 047
2. 574
3. 172
4. 307 549
5. 23
6. 1 154
7. 485
8. 4 903
9. 4 526 361
10. 395 943
11. 1 404
12. 8 091
13. 99 r 18
14. 24 r 42
15. 27
16. 54 r 6
17. 122
18. 130
19. 31
20. 1 722
21. 497 550
22. 1 111

ANSWER TO RIDDLE: 4 u 2 C

B. $A = \frac{53}{60}$

$S = \frac{1}{6}$

$T = \frac{2}{33}$

$B = \frac{7}{12}$

$G = \frac{13}{36}$

$H = 2$

$N = \frac{6}{25}$

$L = 4$

$K = \frac{31}{16} = 1\frac{15}{16}$

$E = 5$

$P = 12\frac{2}{5}$

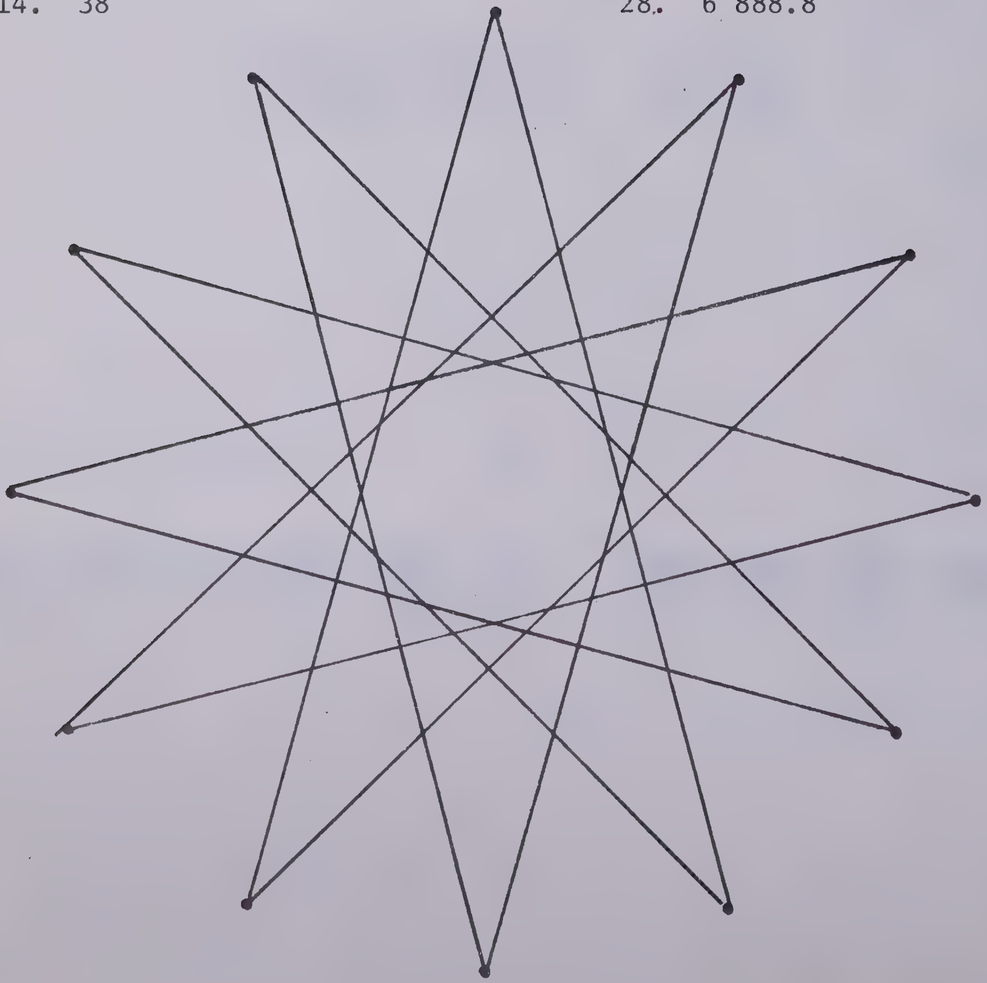
$I = 1\frac{5}{7}$

ANSWER TO RIDDLE:

Thinking; it's painless.

C. Total cost of services: $85.66

D. 1. 7.98
2. 16.04
3. 25
4. 1.44
5. 9.23
6. 9.15
7. 0.15
8. 0.019 52
9. 2.025
10. 0.000 7
11. 0.030
12. 8.06
13. 52.5
14. 38
15. 2.31
16. 0.010
17. 1 002.99
18. 0.64
19. 0.62
20. 71.3
21. 292.921
22. 199.37
23. 3.5
24. 0.10
25. 83.71
26. 64
27. 0.023
28. 6 888.8



Key to Exercises;

Objective A-1 Cont'd

E. 1.

Date	Total Hours	Regular Hrs. $2.50	Overtime Hrs. $3.75	Amt. for Reg. Hrs.	Amt. for Overtime	Total
May 2/75	11	8	3	$20.00	$11.25	$31.25
May 3/75	4.5	4	0.5	10.00	1.88	11.88
May 5/75	8	8	0	20.00	0.00	20.00
May 6/75		8	2.75	20.00	10.31	30.31
May 7/75		8	2	20.00	7.50	27.50
May 8/75		8	1	20.00	3.75	23.75
May 9/75		6	0	15.00	0.00	15.00
May 10/75	4	4	0	10.00	0.00	10.00
May 12/75	9	8	1	20.00	3.75	23.75
May 13/75		8	2.5	20.00	9.38	29.38
May 14/75		8	2	20.00	7.50	27.50
May 15/75	8	8	0	20.00	0.00	20.00
May 16/75		8	2	20.00	7.50	27.50
May 17/75	5	4	1	10.00	3.75	13.75
			Totals	245.00	66.57	311.57

Total for Regular hours $245.00

Total for Overtime 66.57

Gross earnings 311.57

2. At noon May 17th, you received your pay cheque. Calculate how much money you will receive.

Gross Earnings from time sheet $311.57 — 311.57

less C.P.P. = 0.051 x Gross Earnings = 15.89

U.E.I. = 0.012 x Gross Earnings = 3.74

Income tax = Gross Earnings ÷ 5 = 62.31

Compensation = Gross Earnings ÷ 150 = 2.08 — 84.02

Sub Total 84.02 — Net Earnings $227.55

F. 1. $\frac{3}{5} + \frac{2}{3}$

2. 17(20 + 2)

3. (9 x 10) x $\frac{2}{3}$

4. (19 + 1) + 12

5. 0

6. $\frac{2}{3}$

7. 1

8. (15 x 4) x 7

9. (2 + 3) + 8

10. 26.3

11. 9 x 7 + 9 x 5

12. 8 x 200

13. 25 x 0

14. (30 + 2)

15. 10 x 9

Objective No. A-5

A. 1. 0

2. 0

3. 0

4. 0

5. 0

B. 1. $^{+}7$

2. 0

3. 0

4. 0

5. $^{+}16$

6. $^{-}6$

7. $^{+}8$

8. 1

9. 0

10. $^{+}25$

C. 1.	0	3	7.	$^{+}4$	2
2.	$^{-}15$	2	8.	0	2 & 1
3.	$^{+}6$	1	9.	$^{+}7$	1
4.	0	2 & 3	10.	$^{-}15$	2
5.	$^{+}6$	1 & 2	11.	0	3
6.	0	3	12.	0	1, 2 & 3

Objective No. A-5: Cont'd

D. A = 0

B = $^{-}9$

C = $^{+}11$

E = $^{-}6$

F = $^{+}8$

G = $^{-}3$

H = $^{+}10$

I = $^{-}15$

J = $^{+}12$

L = $^{+}16$

M = $^{-}4$

N = $^{+}20$

O = $^{-}21$

R = $^{+}22$

S = $^{+}6$

T = $^{-}7$

U = $^{-}14$

ANSWER TO RIDDLE:

Math is a clean subject: it is smog free.

Objective No. A-6

A.

H	$^{+}6$	O	$^{+}100$	W	$^{+}30$
I	$^{-}10$	R	$^{+}15$	A	$^{-}7$
L	$^{-}2$	S	$^{-}5$	D	$^{+}12$
M	$^{-}3$	T	$^{-}17$	E	$^{-}14$
N	0	U	$^{-}22$	G	$^{+}19$

ANSWER TO RIDDLE: I am the world's greatest Math Student.

B. 1. $^{+}6$ 2. $^{-}15$ 3. $^{+}21$ 4. $^{-}33$ 5. $^{-}5$

C. 1. 0

2. $^{+}5$

3. 0

4. $^{+}15$

5. 0

6. 0

7. $^{-}6$

8. $^{-}12$

9. $^{-}17$

10. 0

Objective No. A-7

A. 1. credit

2. debit

3. positive

4. +60, -43, -85, +70

5. $458.00

6. +450.00

7. -8.00

8.

+260.00	+217.00
+217.00	+142.00
+132.00	+ 52.00
+202.00	+102.00
+122.00	+ 72.00
+ 67.00	+192.00

B. S = $^{+}8$

T = $^{+}6$

N = $^{+}14$

S = $^{-}7$

T = $^{-}12$

E = $^{-}1$

V = $^{+}5$

S = $^{+}9$

N = $^{-}3$

E = $^{+}7$

T = $^{-}19$

I = $^{-}15$

C = $^{+}1$

A = $^{-}39$

H = $^{-}11$

I = $^{+}25$

M = $^{-}5$

E = $^{-}6$

I = $^{-}20$

N = $^{+}4$

I = $^{-}4$

A = $^{-}9$

ANSWER TO RIDDLE:

A stitch in time saves nine.

Objective No. A-7 Cont'd

D. H = $^{+}5$

D = $^{+}4$

L = $^{+}15$

A = $^{-}9$

O = $^{+}1$

C = $^{-}20$

R = $^{-}41$

W = $^{-}12$

T = $^{+}40$

I = $^{-}24$

K = $^{+}10$

M = $^{-}26$

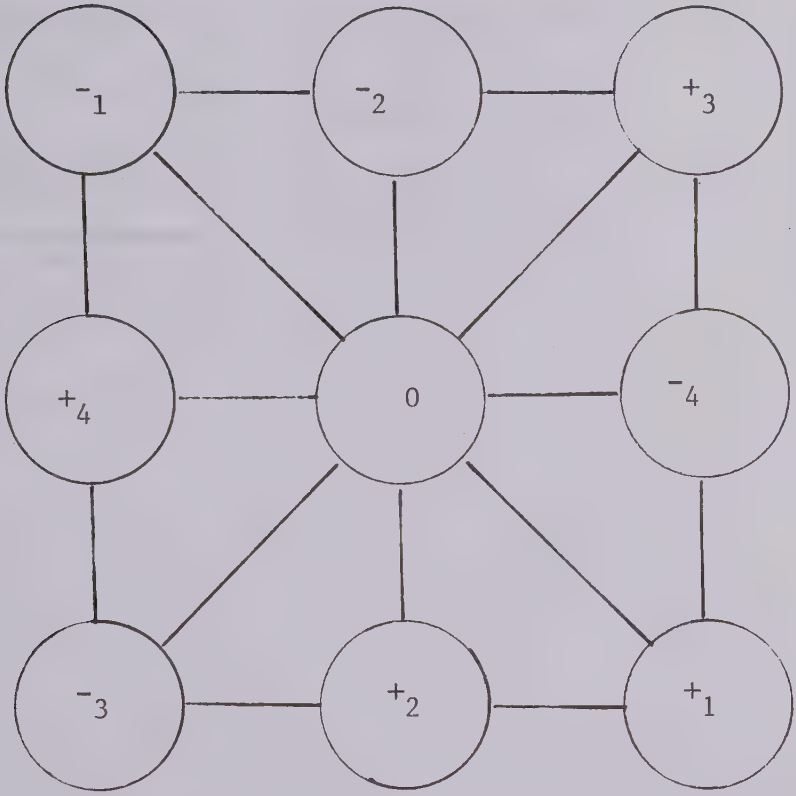
N = $^{-}15$

E = $^{+}19$

S = $^{-}1$

ANSWER TO RIDDLE: The tailor sews nice seams and the kiss seems so nice.

E.



Objective A-7 Cont'd

F. 1.

+5	+8	+13
+6	+9	+15
+11	+17	+28

2.

-3	+4	+1
-7	+9	+2
-10	+13	+3

3.

+19	-8	+11
-10	+3	-7
+9	-5	+4

4.

-6	0	-6
+6	0	+6
0	0	0

5.

+6	-10	-4
-8	+12	+4
-2	+2	0

6.

+3	+19	+12	+34
-7	-9	+17	+1
-1	-6	-6	-13
-5	+4	+23	+22

Objective A-8

A.

J	$^{+}12$	G	0	R	$^{-}33$
C	$^{+}3$	H	$^{+}18$	S	$^{+}6$
D	$^{-}14$	I	$^{+}8$	T	$^{-}7$
E	$^{+}4$	N	$^{+}2$	X	$^{+}10$
F	$^{+}20$	O	$^{+}1$	Y	$^{-}5$

ANSWER TO RIDDLE: I enjoyed doing this set of exercises.

Objective No. A-8 Cont'd

B. 1.

a.	$^{+}6$, $^{+}11$	d.	$^{-}8$, $^{-}3$
b.	$^{+}2$, $^{+}11$	e.	$^{+}2$, $^{-}5$
c.	$^{-}3$, $^{-}7$	f.	$^{+}15$, $^{+}3$

2.

a.	+, $^{-}2$	d.	+, $^{+}2$
b.	+, $^{+}9$	e.	+, $^{-}1$
c.	+, $^{-}11$	f.	+, $^{-}6$

3.

a.	+, $^{+}2$, $^{-}4$	i.	$^{+}24$
b.	+, $^{-}3$, $^{+}3$	j.	$^{-}8$
c.	+, $^{-}3$, $^{+}3$	k.	$^{-}7$
d.	+, $^{-}19$, $^{+}1$	l.	$^{-}19$
e.	+, $^{+}5$, $^{+}5$	m.	$^{+}2$
f.	+, $^{-}15$, $^{-}50$	n.	$^{+}6$
g.	$^{+}13$	o.	$^{+}10$
h.	$^{-}8$	p.	$^{-}9$

C.

1.

+3	-8	+11
+7	-5	+12
-4	-3	-1

2.

-15	+3	-18
+7	-9	+16
-22	+12	-34

3.

+4	-10	+14
-3	+6	-9
+7	-16	+23

Objective A-9

A. 1.

a. +12 b. +12 c. +4 d. +21 e. +20

f. +30 g. +24 h. +24 i. +45 j. +56

B. 1.

a. +8 b. +24 c. +42 d. +35 e. +48

f. +36 g. +63 h. +40 i. +45 j. +22

C. 1. positive 2. positive

D. 1. + 2. - 3. -7 4. +7 5. -5

E. 1. -10 2. -12 3. -18 4. -28 5. -56

6. -30 7. -45 8. -4 9. +2 10. +5

F. a. Negative b. negative

G. 1. +8 2. +2 3. +2 4. +3 5. +4 6. +6

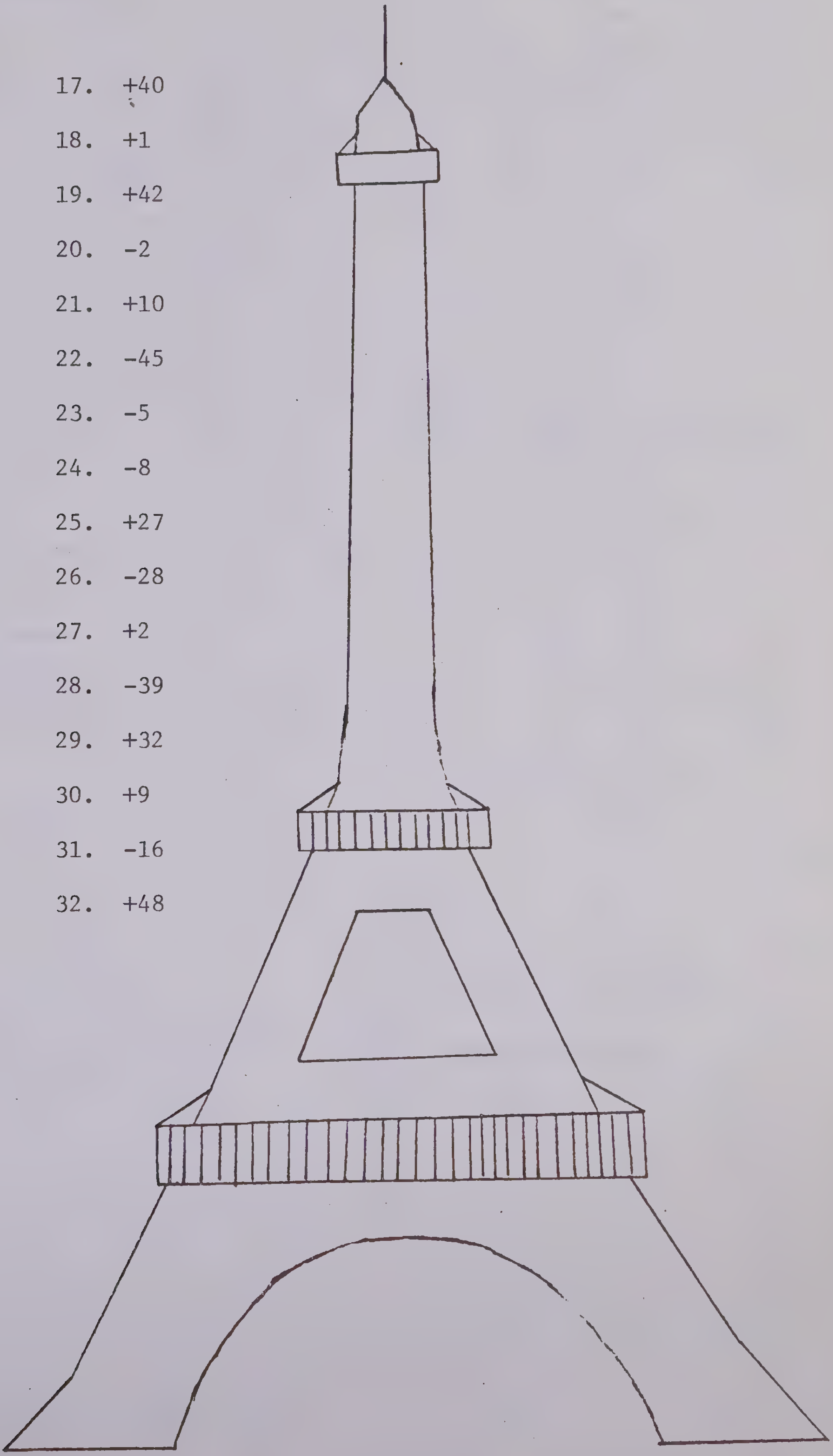
7. +4 8. +5 9. -4 10. -5 11. -6 12. -7

13. +5 14. +4 15. -3 16. -8 17. +7 18. -5

Objective A-9 Cont'd

H. 1. +48
2. +35
3. -12
4. +20
5. -60
6. +7
7. +3
8. +5
9. +16
10. -4
11. +12
12. -9
13. -22
14. +21
15. +4
16. -3
17. +40
18. +1
19. +42
20. -2
21. +10
22. -45
23. -5
24. -8
25. +27
26. -28
27. +2
28. -39
29. +32
30. +9
31. -16
32. +48

FRANCE



Objective No. A-11

A. 1. $^{+}15^{\circ}$
2. $^{+}10^{\circ}$
3. -5°
4. -15°
5. -5°
6. -10°

B. 2. -5°
3. -5°
4. -15°
5. -5°, $+5^{\circ}$
6. -10^{0}

D. 1. 8, +3
2. 0, -4
3. -7, -5
4. -12, -6
5. +5, -4

G. 1. < , S
2. > , L
3. =, E
4. < , S
5. < , S
6. < , S
7. < , S
8. >, L
9. > , L
10. >, L
11. >, L
12. <, S
13. = , E
14. <, S
15. =, E
16. > , L
17. > , L
18. > , L

ANSWER TO RIDDLE:

Silly Sally sells sea shells.

Objective No. B-1

A. ANSWER TO RIDDLE: Because he could not hack it.

Objective No. B-1 Cont'd

B.

T	7.540 8	D	47.994	T	7.540 8
O	4.25	A	11.47	O	4.25
S	27.93	Y	5.72	Y	5.72
C	50.99	L	3.899	O	4.25
A	11.47	I	29.03	U	25.283
R	40.257	G	17.917 2		
E	10.75	H	33.575		
T	7.540 8	T	7.540 8		
H	33.575	I	4.25		
E	10.75	N	5.72		

ANSWER TO RIDDLE:

An alarm clock is something to scare the daylight into you.

Objective No. B-5

A. 1. $\frac{2+{}^{-}1}{5} = \frac{1}{5}$ 2. $\frac{-3 + 2}{8} = \frac{-1}{8}$ 3. $\frac{-3 + -4}{2} = \frac{-7}{2}$

4. $\frac{{}^{-}2 + 3}{6} \quad \frac{1}{=6}$ 6. $\frac{{}^{-}1}{4}$ 7. $\frac{3 + 1 + {}^{-}2}{9} = \frac{2}{9}$

B. 2. $\frac{{}^{-}5 + {}^{-}4}{6} = \frac{-9}{6}$ 3. $\frac{{}^{-}10}{8} = \frac{3 + {}^{-}10}{8} = \frac{-7}{8}$

4. $\frac{-25}{10} = \frac{3 + {}^{-}25}{10} = \frac{-22}{10}$ 5. $\frac{-12}{15} = \frac{-10 + {}^{-}12}{15} = \frac{-22}{15}$

6. $\frac{8}{12} + \frac{-9}{12} = \frac{8 + {}^{-}9}{12} = \frac{-1}{12}$ 7. $\frac{{}^{-}3 + 7}{2} = \frac{4}{2}$

8. $\frac{-5}{4} + \frac{-5}{2} = \frac{-5}{4} + \frac{-10}{4} = \frac{-5 + {}^{-}10}{4} = \frac{-15}{4}$

Objective No. B-5 Cont'd

D.

[✓ $-6\frac{2}{3}$]	[✓ $\frac{-7}{12}$]	$1\frac{2}{3}$	$\frac{6}{7}$	[✓ $\frac{5}{6}$]
[✓ $-1\frac{17}{24}$]	[✓ $\frac{-1}{20}$]	[✓ $4\frac{5}{6}$]	[✓ $\frac{1}{6}$]	$2\frac{2}{15}$
$\frac{-5}{6}$	$\frac{7}{15}$	[✓ $\frac{1}{15}$]	$2\frac{2}{3}$	[✓ $^{-}1$]
[✓ $1\frac{5}{14}$]	$-4\frac{5}{6}$	$\frac{4}{9}$	[✓ $2\frac{7}{12}$]	$\frac{1}{3}$
$\frac{-7}{11}$	[✓ $\frac{8}{15}$]	[✓ $\frac{-11}{15}$]	$-5\frac{2}{3}$	[✓ $\frac{5}{9}$]

Objective No. B-6

A. 2. 0

3. $\frac{-4}{7}$

4. $\frac{+2}{3}$

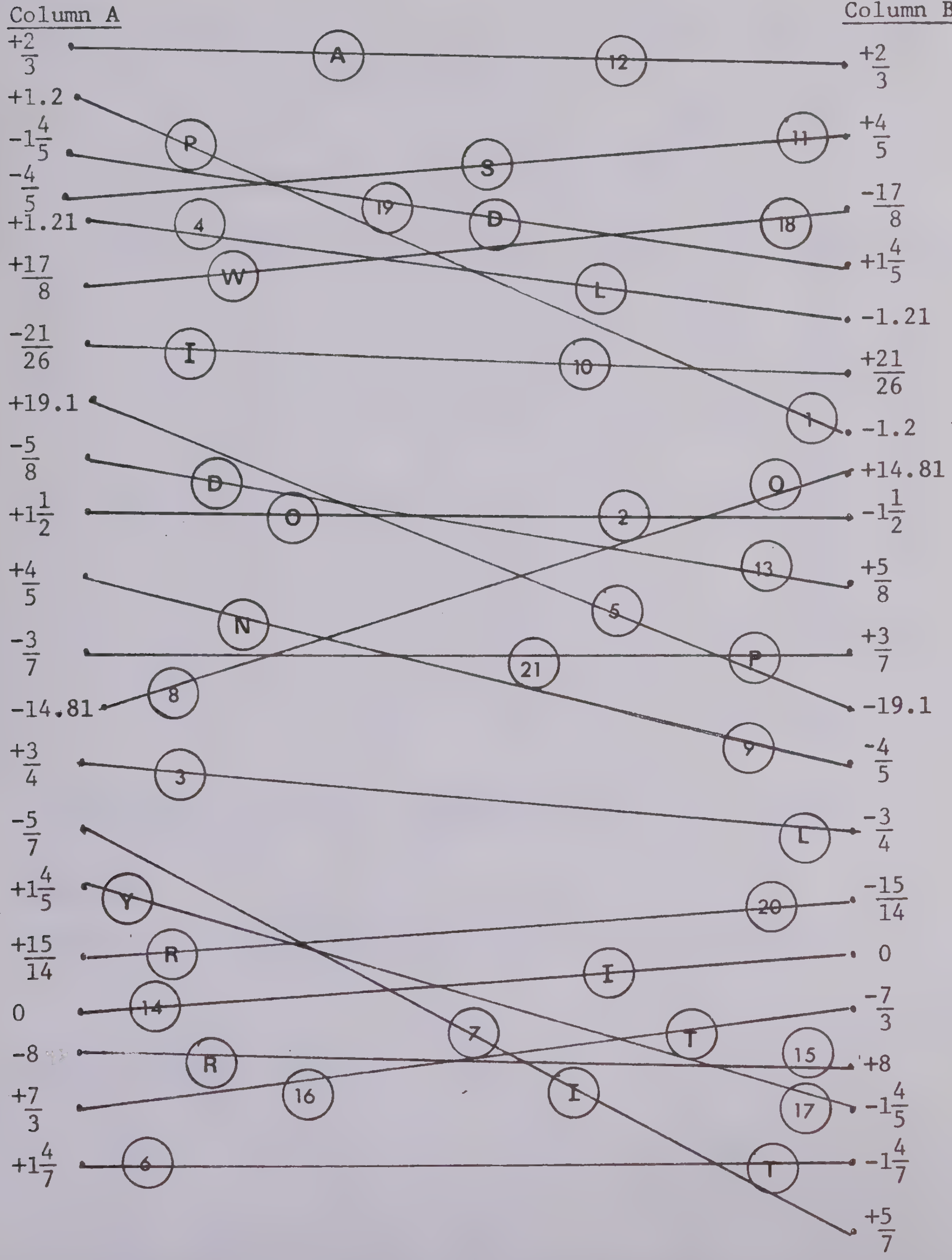
5. $-4\frac{5}{8}$

6. $+17\frac{3}{4}$

7. +3, +0.3, -0.3

Objective No. B-6   Cont'd

B.



1	2	3	4	5	6	7	8	9	1	11	12	13	14	15	16	17	18	19	20	21
P	O	L	L	U	T	I	O	N	I	S	A	D	I	R	T	Y	W	O	R	D

Objective No. B-7

A. 1. $-$

2. $+$, $\frac{+6}{8}$, $\frac{+6}{8}$

3. $\frac{+11}{5}$, $+33$

4. 32 , 32

5. $+$, $-$, $+49$, -10 , $+39$

6. $\frac{+69}{12}$, $\frac{-80}{12}$, $\frac{-11}{12}$

7. $+$, $+ 7.3$, -5.9

B. W: $\frac{15}{7}$

L: $\frac{-34}{15}$

S: $2\frac{1}{5}$

E: -11.92

A: 3

F: -18.8

Y: 53.7

N: 46.10

O: $\frac{41}{30}$

R: 1.311

G: -4

ANSWER TO RIDDLE: As well as any golfer.

C. ANSWER TO RIDDLE: I must admit it was not easy.

Objective No. B-8

A. 1. $\frac{4}{5}$, $\frac{12}{20}$ or $\frac{3}{5}$

2. $\frac{7}{3} \times \frac{3}{5} = \frac{21}{15}$ or $\frac{7}{5}$

3. 10

4. $\frac{11}{4} \times \frac{3}{4} = \frac{33}{16}$ or $2\frac{1}{16}$

5. 10

6. 11, 7, $\frac{77}{6}$ or $12\frac{5}{6}$

Objective No. B-8 Cont'd

B. 1. 12

2. 15

3. $\frac{-8}{27}$

4. $\frac{-6}{20}$ or $\frac{-3}{10}$

1. 3, -3, $\frac{-9}{8}$ or $1\frac{1}{8}$

2. $\frac{28}{24}$ or $1\frac{2}{24}$ or $1\frac{1}{16}$

3. $\frac{-2}{5} \times \frac{+5}{2} = \frac{-10}{10}$ or $^{-}1$

4. $\frac{-9}{4} \times \frac{-11}{3} = \frac{+99}{12}$ or $8\frac{7}{12}$

C.	N	$\frac{+2}{18}$ or $\frac{+1}{9}$	L	$\frac{-10}{21}$	V	$\frac{-72}{30}$ or $-2\frac{12}{30}$ or $-2\frac{2}{5}$
	A	$\frac{-3}{12}$ or $\frac{-1}{4}$	I	$\frac{+9}{24}$ or $\frac{+3}{8}$	H	$\frac{+2}{15}$
	D	$\frac{+4}{10}$ or $\frac{+2}{5}$	Y	$\frac{-15}{32}$	R	$\frac{+21}{32}$
	C	$\frac{+4}{6}$ or $\frac{+2}{3}$	K	$\frac{+10}{21}$	U	$\frac{-24}{24}$ or $^{-}1$
	G	$\frac{-21}{32}$	F	$\frac{+10}{24}$ or $\frac{5}{12}$	T	$\frac{+50}{6}$ or $8\frac{2}{6}$ or $8\frac{1}{3}$
	E	$\frac{+12}{8}$ or $+1\frac{4}{8}$ or $+1\frac{1}{2}$	S	$\frac{-26}{35}$	O	$\frac{+152}{12}$ or $+12\frac{2}{3}$

GUILLOTINE:	A short cut to heaven.
HYPODERMIC NEEDLE:	A sick shooter.
QUADRUPLETS:	Four crying out loud.

Objective No. B-9

A. 1. $\frac{4}{3}$ 2. $\frac{4}{3}$ 3. one (1)

B. 2. $\frac{8}{7}$

3. $\frac{16}{15}$, 1

4. $\frac{1}{6}$

5. $\frac{20}{20} = 1$

6. $\frac{3}{7}$, $\frac{3}{7}$

7. $\frac{1.2}{1.2} = 1$

8. 4, $\frac{4}{1} \times \frac{1}{4} = \frac{4}{4} = 1$

9. $\frac{7}{4}$, $\frac{4}{7} \times \frac{7}{4} = \frac{28}{28} = 1$

10. $\frac{1}{2.8}$, $\frac{1}{2.8} = \frac{1}{1}$

Objective No. B-9 Cont'd

C. 1. $\frac{4}{1}$

2. $\frac{5}{2}$

3. $\frac{8}{7}$

4. $\frac{7}{1}$

5. $\frac{4}{5}$

6. $\frac{5}{13}$

7. $\frac{5}{16}$

8. $\frac{4}{17}$

9. $\frac{1}{1.2}$

10. $\frac{1}{3.4}$

11. $\frac{1}{6.9}$

12. $\frac{1}{11.2}$

13. $\frac{1}{4}$

14. $\frac{1}{9}$

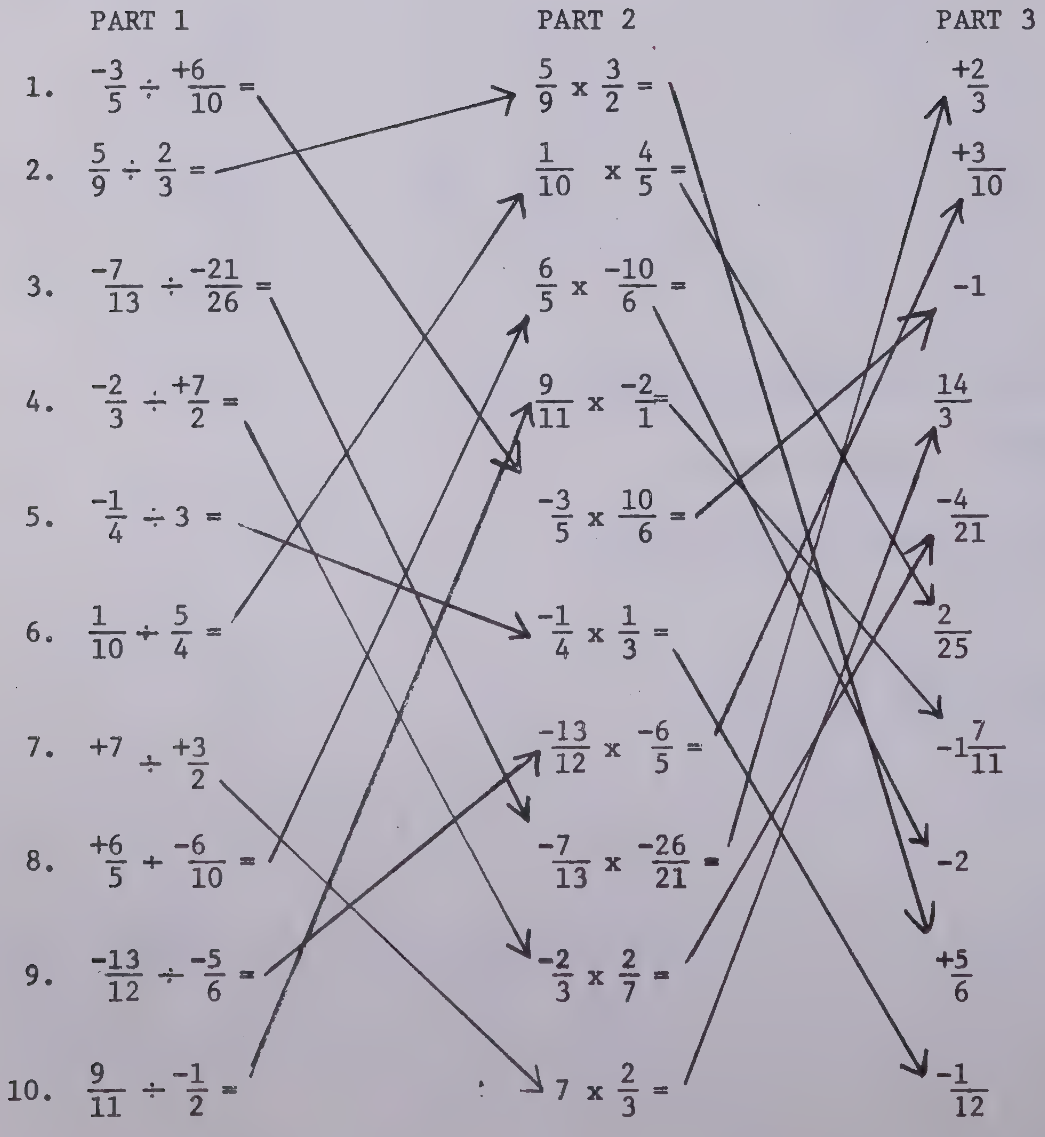
15. $\frac{1}{12}$

16. $\frac{1}{17}$

Objective No. B-10

A. 1. $\frac{4}{1}$ or 4 2. $\frac{-5}{2}$ 3. $\frac{-12}{5}$ 4. X 5. $\frac{3}{10}$

B.



	PART 1	PART 2	PART 3
1.	$\frac{-3}{5} \div \frac{+6}{10} =$	$\frac{5}{9} \times \frac{3}{2} =$	$\frac{+2}{3}$
2.	$\frac{5}{9} \div \frac{2}{3} =$	$\frac{1}{10} \times \frac{4}{5} =$	$\frac{+3}{10}$
3.	$\frac{-7}{13} \div \frac{-21}{26} =$	$\frac{6}{5} \times \frac{-10}{6} =$	-1
4.	$\frac{-2}{3} \div \frac{+7}{2} =$	$\frac{9}{11} \times \frac{-2}{1} =$	$\frac{14}{3}$
5.	$\frac{-1}{4} \div 3 =$	$\frac{-3}{5} \times \frac{10}{6} =$	$\frac{-4}{21}$
6.	$\frac{1}{10} \div \frac{5}{4} =$	$\frac{-1}{4} \times \frac{1}{3} =$	$\frac{2}{25}$
7.	$+7 \div \frac{+3}{2}$	$\frac{-13}{12} \times \frac{-6}{5} =$	$-1\frac{7}{11}$
8.	$\frac{+6}{5} + \frac{-6}{10} =$	$\frac{-7}{13} \times \frac{-26}{21} =$	-2
9.	$\frac{-13}{12} \div \frac{-5}{6} =$	$\frac{-2}{3} \times \frac{2}{7} =$	$\frac{+5}{6}$
10.	$\frac{9}{11} \div \frac{-1}{2} =$	$7 \times \frac{2}{3} =$	$\frac{-1}{12}$

Objective No. B-10 Cont'd

C. $\frac{2}{5}$

$\frac{-3}{4}$

$\frac{-9}{8}$ or $-1\frac{1}{8}$

$\frac{-52}{21}$ or $-2\frac{10}{21}$

$\frac{1}{2}$

$\frac{-5}{2}$ or $-2\frac{1}{2}$

$\frac{-10}{3}$ or $3\frac{1}{3}$

$\frac{32}{57}$

$\frac{9}{8}$ or $1\frac{1}{8}$

$\frac{-8}{33}$

0

-25

$\frac{-4}{3}$ or $-1\frac{1}{3}$

$\frac{-3}{10}$

$\frac{-8}{9}$

$\frac{-33}{8}$ or $4\frac{1}{8}$

$\frac{21}{4}$ or $5\frac{1}{4}$

32

$\frac{-8}{9}$

-1

Objective No. B-11

A. 1. 0

2. 0

3. 0

4. 0

5. 0

B. 1. $\frac{+2}{5}$

2. 0

3. 0

4. 0

5. -6.2

C. 1. $\frac{+7}{9}$

2. $\frac{-3}{11}$

3. 1

4. 0

5. $\frac{-6}{13}$

Objective No. B-11 Cont'd

D. 1. 1.63
2. $\frac{-3}{5}$
3. 0
4. $8\frac{2}{5}$
5. $-1\frac{2}{3}$
6. $\frac{2}{3}$
7. $\frac{-3}{8}$
8. -3.6
9. -6.32
10. $\frac{17}{3}$
11. $\frac{-5}{7}$
12. -2.3

HIDDEN GAME: Hockey

Objective No. B-12

A. 1. 8
2. 4
3. 2, $5\overline{)2}$
4. 4, 5, $5\overline{)4}$

B. 1. 0.625
2. 0.5
3. 0.4
4. 4.5

C. 1. 0.6
2, 0.25
3. 0.3
4. 0.35
5. 3.5
6. 2.25
7. 0.37
8. 0.023
9. 2.2
10. 0.516

D. 1.

DECIMAL	NUMBER OF DIGITS AFTER THE DECIMAL POINT	DENOMINATOR TO BE USED	EQUIVALENT FRACTION
0.009	3	1 000	$\frac{9}{1\ 000}$
0.41	2	100	$\frac{41}{100}$
0.3	1	10	$\frac{3}{10}$
0.07	2	100	$\frac{7}{100}$
5.2	1	10	$\frac{52}{10}$
4.75	2	100	$\frac{475}{100}$
2.031	3	1 000	$\frac{2\ 031}{1\ 000}$

Objective No. B-12 Cont'd

D. 2.

Decimal	Meaning	Equivalent Fraction	Reduced Fraction
a. 0.8	eight tenths	$\frac{8}{10}$	$\frac{4}{5}$
b. 0.04	Four hundredths	$\frac{4}{100}$	$\frac{1}{25}$
c. 0.003	Three thousandths	$\frac{3}{1\ 000}$	-
d. 5.4	Fifty-four tenths	$\frac{54}{10}$	$\frac{27}{5}$
e. 9.75	Nine hundred & seventy five hundredths	$\frac{975}{100}$	$\frac{39}{4}$
f. 0.320	Three hundred and twenty thousandths	$\frac{320}{1\ 000}$	$\frac{8}{25}$
g. 0.81	Eighty one hundredths		
h. 3.102	Three thousand, one hundred & two thousandths	$\frac{3\ 102}{1\ 000}$	$\frac{1\ 551}{500}$
i. 0.23	Twenty three hundredths	$\frac{23}{100}$	
j. 0.406	Four hundred and six thousandths	$\frac{406}{1\ 000}$	$\frac{203}{500}$

E. S $0.60 = \frac{60}{100}$ or $\frac{3}{5}$

H $3.2 = \frac{32}{10}$ or $\frac{16}{5}$

A $5.05 = \frac{505}{100}$ or $\frac{101}{20}$

P $0.002 = \frac{2}{1\ 000}$ or $\frac{1}{500}$

T $9.014 = \frac{9\ 014}{1\ 000}$ or $\frac{4\ 507}{500}$

E $15.5 = \frac{155}{10}$ or $\frac{31}{2}$

C $0.75 = \frac{75}{100}$ or $\frac{3}{4}$

D $0.03 = \frac{3}{100}$

O $0.3 = \frac{3}{10}$

A $0.7 = \frac{7}{10}$

V $1.2 = \frac{12}{10}$ or $\frac{6}{5}$

E $3.01 = \frac{301}{100}$

L $0.52 = \frac{52}{100}$ or $\frac{13}{25}$

I $22.4 = \frac{224}{10} = \frac{112}{5}$

M $3.004 = \frac{3\ 004}{1\ 000}$ or $\frac{751}{250}$

A $2.41 = \frac{241}{100}$

N $0.61 = \frac{61}{100}$

I $1.95 = \frac{195}{100}$ or $\frac{39}{20}$

ANSWER TO RIDDLE: Decimals have a point.

Objective No. B-12 Cont'd

F. 1. $\frac{1}{2} = 0.5$

2. $\frac{3}{5} = 0.6$

3. $\frac{3}{25} = 0.12$

4. $\frac{7}{20} = 0.35$

5. $\frac{13}{20} = 0.26$

6. $\frac{3}{8} = 0.375$

7. $\frac{17}{20} = 0.85$

8. $\frac{12}{25} = 0.48$

9. $\frac{7}{10} = 0.7$

10. $\frac{1}{5} = 0.2$

11. $\frac{1}{4} = 0.25$

12. $\frac{1}{8} = 0.125$

13. $\frac{4}{5} = 0.8$

14. $\frac{3}{4} = 0.75$

15. $\frac{3}{100} = 0.03$

0.125	0.25	0.32	0.03	0.15
0.8	0.48	0.5	0.6	0.412
0.126	0.21	0.12	0.84	0.375
0.535	0.7	0.9	0.75	0.16
0.2	0.85	0.35	0.72	0.26

Objective No. B-14

A. 1. a. $\frac{6}{10}$

b. $\frac{9}{10}$

c. $\frac{4}{10}$

d. $\frac{9}{10}$

e. $\frac{6}{10}$

f. $\frac{4}{10}$

3. a. >

b. <

c. =

d. >

e. $\frac{1}{8}$

f. $\frac{7}{8}$

4. a. $\frac{2}{6}$ =

b. $\frac{4}{10}$ >

c. $\frac{-2}{4}$ <

d. $\frac{-9}{12}, \frac{-8}{12}$ <

e. $\frac{-8}{10}$ >

5. a. >

b. >

c. =

d. <

e. =

Objective No. B-14 Cont'd

B. 2. a. >

b. >

c. >

d. =

e. >

f. >

g. =

h. >

i. =

j. <

C. 1.

V =

O >

L <

I >

B <

Y =

C >

X <

E =

S =

U >

Q <

R >

P <

N =

A <

M >

G =

W <

T >

Remaining letters:

O I C U R M T

(Oh. I see you are empty)

Objective No B-16

A. 1. 7

2. -3

3. 3

4. 13

5. -15

6. 16

7. 0

8. +6

9. -4

10. 24

B. 1. -17

2. 11

3. 31

4. 2

5. 17

6. 5

7. -150

8. -9

9. 4

10. $\frac{-3}{2}$

11. 4.05

12. 0

13. 35

14. $\frac{-7}{3}$ or $-2\frac{1}{3}$

15. -38

16. $\frac{13}{6}$ or $2\frac{1}{6}$

Objective No. B-16 Cont'd

BLOCK II

3 MATH	$\frac{6}{7}$ IS	-7 A	0 CHALLENGE
$\frac{5}{3}$ TO	-0.273 YOUR	2 MIND	$\frac{-2}{3}$ AND
4.5 DON'T	-8 YOU	7 FORGET	17 IT

Objective No. B-17

A. 4. Yes, -2, Yes

5. 2, $-3 > -9$, TRUE

3. $+3 > 0$, TRUE

4. $-5 < -2$ TRUE

5. $-1 < +2$ TRUE

6. $-1 = -1$, TRUE

B. 3.

	NEW STATEMENT	TRUE OR FALSE	CORRECTION
b.	$+21 = {}^{+}21$	TRUE	
c.	${}^{-}2 < 0$	TRUE	
d.	${}^{-}12 > {}^{+}24$	FALSE	${}^{-}12 < {}^{+}24$
e.	${}^{-}28 > {}^{-}42$	TRUE	
f.	${}^{-}6 < {}^{-}21$	FALSE	${}^{-}6 > {}^{-}21$
g.	${}^{-}12 > {}^{+}6$	FALSE	${}^{-}12 < {}^{+}6$
h.	${}^{+}10 = {}^{+}10$	TRUE	
i.	${}^{+}20 < {}^{-}5$	FALSE	${}^{+}20 > {}^{-}5$
j.	${}^{-}8 > {}^{+}8$	FALSE	${}^{-}8 < {}^{+}8$

Objective No. B-17 Cont'd

C.
- a. TRUE - G
- b. TRUE - A
- c. FALSE - M
- d. TRUE - T
- e. TRUE - M
- f. FALSE - I
- g. TRUE - H
- h. FALSE - A
- i. TRUE - I
- j. TRUE - A
- k. TRUE - C
- l. FALSE - N

DEFINITION: Math Magician

Objective No. B-18

A. 3. a. -7
10
10

b. -3 -3
0 5
5

c. $+5$
14
14

d. $-\frac{2}{5}$
0 $\frac{1}{5}$
$\frac{1}{5}$

e. 2 f. 13 g. $\frac{1}{4}$ h. 1.0

4. a. $\frac{1}{3}$
3
8
8

b. $\frac{1}{6}$
$\frac{30}{6}$
5
5

c. $\frac{9}{1}$
$\frac{63}{1}$
63
63

d. $\frac{1}{1.3}$
1.3
20
20

e. 9
f. 27
g. 0.4
h. 10

5. a. $^-1$
$\frac{1}{2}$
2
4
4

b. $^+4$
12
12
12
12
2
2

c. $^-5$
$\frac{4}{1}$
$\frac{20}{1}$
20
20

d. $^-0.3$
$\frac{1}{1.2}$ $\frac{1}{1.2}$
$\frac{3.6}{12}$
3

e. 3
f. 3
g. 16

6. a. 18
18
9
9

b. $\frac{1}{9}$
$\frac{18}{9}$
2
2

c. 3
$\frac{1}{6}$ $\frac{1}{6}$
$\frac{6x}{6}$ $\frac{12}{6}$
2
2

d. 1.2
$\frac{1}{3}$
$\frac{2.4}{0.3}$
8
8

e. 3
f. 7
g. $\frac{33}{2}$
h. $\frac{11}{2}$

Objective No. B-18 Cont'd

7. a. +3 +3 18 18	a. $p > 2.4$
b. $\frac{4}{5}$ $\frac{60}{5}$ 12 12	b. $z > 4$
c. < < < <	c. -40
d. $\frac{4}{3}$ $\frac{4}{3}$ $\frac{12x}{12}$ $\frac{72}{3}$ 24 24	d. 2
e. > -3 -4 -4	f. -4
g. $\frac{1}{-7}$ $\frac{1}{-7}$ -7 -7 $\frac{18}{-7}$ $\frac{18}{-7}$	g. 0.9
h. > > > >	h. 2

Key to Exercises

Objective No. B-18

B. 1.

	Column A	Column B
a.	12m	48
b.	$\frac{5}{4}x$	20
c.	x	-3, 9
d.	x	$\frac{3}{4}, \frac{11}{12}$
e.	3x, 5x	24
f.	0.3x, 0.4x	1.4
g.	$\frac{3x}{8}$	$\frac{9}{2}$
h.	$\frac{-2y}{3}$	$\frac{6}{1}$
i.	$5\frac{1}{3}y$	-1, 31
j.	5x	6, 26

2. 2x, 5x, 0.7x

   4, $\frac{1}{2}$, 0.6, $\frac{7}{8}$

   3y, $\frac{3}{4}$y, 0.4y

3. a. $7x = 14$

   b. $x + 0 = 6$

   c. $4x + 0 = 16$

   d. $1y = 6$

   e. $0.5a = 10$

4. a. $x = 13$

   b. $x = -3$

   c. $t = 6$

   d. $x = -2$

   e. $y = 1$

   f. $x = 24$

   g. $m = 10$

   h. $m = 41$

   i. $y = 16$

   j. $y = 2$

   k. $x = 24$

   l. $m = 35$

Objective No. B-18 Cont'd

5. a. $x = 13$

b. $x = 6$

c. $m = 2$

d. $y = 6.0$

e. $x = \frac{1}{12}$

f. $x = \frac{4}{15}$

g. $w = 0$

h. $p = 2\frac{2}{3}$

i. $x = 2.6$

j. $y = 5.0$

k. $y = 5$

l. $3 = -16$

6. a. $x = 5$

b. $t = 5$

c. $a = 8$

d. $m = 2$

e. $x = 77$

f. $y = -4$

g. $x = -5$

h. $x = 1$

i. $y = 5$

j. $a = 2\frac{1}{5}$

7. a. $x = 5$

b. $x = 18$

c. $n = 0.8$

d. $m = 1$

e. $x = -2$

f. $y = -9$

g. $t = 0.3$

h. $x = -4$

8. a. $x = 8$

b. $x = 2$

c. $x = 3$

d. $x = 20$

e. $y = 12$

f. $y = 3$

g. $m = 6$

h. $y = 28$

9. a. $x < 4$

b. $y < 8$

c. $x < 2$

d. $x < 6$

e. $x > -1$

f. $x < 10$

g. $x < 1$

h. $x < 3$

Objective No. B-18 Cont'd

C. x = 3
x = 2
x = 21
x = 7
x = -4
x = -2
x = 1.3
x = -3
$x = 2\frac{2}{3}$
x = 12
x = 28
x = 13
x = 54
x = 0.8
x = 4
x = -6
x = 6
x = -2.7
x = 10
x = 0.3
x = 5
$x = \frac{1}{4}$
x = 2.6
x = 3.5
x = -11

3	0.3	13	2.6	2
5	6	7	0.8	$2\frac{2}{3}$
-3	-4	-2	-6	$\frac{1}{4}$
~~10~~	~~-2.7~~	~~12~~	~~28~~	~~1.3~~
21	54	3.5	4	-11

Objective No. B-19

B. 1. $^{+}4$, 32, 32 = 32 correct

2. $\frac{^{-}3}{8} + \frac{^{-}3}{12}$, $\frac{^{-}15}{24}$ correct

3. 10 + 15, 25 incorrect

4. 5, 10, 7 = 7 correct

5. $\frac{29}{3}$ or $9\frac{2}{3}$, $\frac{29}{12}$, $\frac{21}{12}$ or $1\frac{9}{12}$ or $1\frac{3}{4} = 1\frac{3}{4}$ correct

6. 6, 6, 2 incorrect

7. 3, $^{-}2$, $^{-}2$, $^{-}6$, $^{-}18$, 11 = 11 correct

8. $\frac{^{-}1}{7}$, $^{-}2$ incorrect

C. 1. incorrect
2. correct
3. correct
4. correct
5. correct
6. correct
7. correct
8. correct

D. 1. 7
2. $\frac{1}{3}$ or $\frac{2}{6}$
3. 15
4. $13\frac{1}{3}$
5. 6
6. 21
7. $^{-}3$
8. 5
9. 5
10. $\frac{10}{14}$ or $\frac{5}{7}$
11. 7
12. 63
13. 5
14. 3
15. 3

Objective No. B-22

A. 1. $n + 3$
2. $4 + n$
3. $n + 7$
4. $n + 12$
5. $n + 5$
6. $t + 13$
7. $21 + n$
8. $p - 8$
9. $n - 6$
10. $n - 12$
11. $n - 15$
12. $13 - n$
13. $n - 11$
14. $7 \times n$ or $7n$
15. $3 \times n$ or $3n$
16. $\frac{3}{4}t$
17. $\frac{7}{16}m$
18. $\frac{5}{8}m$
19. $4n > 7$
20. $\frac{n}{6}$ or $n \div 6$
21. $\frac{n}{15}$ or $n \div 15$
22. $n = 14$
23. $2n = 41$
24. $6n = 22$
25. $47 + n = 142$
26. $n - 115 = 6$
27. $n < 7$
28. $5n < 3$
29. $n + 6 < 17$
30. $12 - n = 3$
31. $8 < 4n$
32. $2n = 12$
33. $n + 6 > 14$
34. $4 - n = 6$
35. $3n < n - 4$
36. $6n > n + 3$
37. $n + 5\frac{1}{3} < n$
38. $n - 3 = 5$
39. $n + 4 < 23$
40. $n + (3n - 2)$
41. $5n + 8 > 2n$
42. $2n - 4 = 31$
43. $21 = 4n + 3$
44. $n - 6 = 12$
45. $n + 3$
46. $n - 4$
47. $n - 6 = 9$

B. 1. $n + 11$ or $11 + n$
2. $n - 6 = 4$
3. $2n < 3n$
4. $3n + 5$
5. $20n$
6. $n + 7$
7. $\frac{n}{6} > 8$
8. $\frac{1}{3}n < \frac{1}{2}n$
9. $18 - 3n = 15$
10. $n + 4 = 7$
11. $9 + (n + 7)$
12. $12 - n = 4$
13. $27 - n = -8$
14. $n + 6 = 12$
15. $\frac{n}{1} = n$

C. ANSWER TO RIDDLE: The thing that makes mole hills out of mountains.

Objective No. B-23

A. 1. $^{+}3$, $^{+}3$, $2n$ 14, 7,

$7 + 7$, 14, 17

10 and 7

2. $6n + 12 = 42$

$6n + 12 + {}^{-}12 = 42 + {}^{-}12$

$6n = 30$

$n = 5$

3. $x + x - 18 = 48$

$2x - 18 = 48$

$2x = 30$

$x = 15$

Numbers are 15 and 33

4. $8x - 6 = 10$

$8x = 16$

$x = 2$

B. 1. x, width, x, 9, 28, $2x + 18$, $2x + 18 + {}^{-}18$, 10, 10, 5, 28, 5 cm.

2. x, $4x$ or $x + x + x + x = 24$

3. $x + 3x + x + 3x = 32$

$8x = 32$ 12 cm by 4 cm

$x = 4$

C. 1. x, $x + 5$, $x + x + 5 = 29$, $5 = 29$, 5, 24, 24, 12, 12 boys and 17 girls.

2. -1.73, $x + 4x - 1.73 = 17.02$

$5x = 18.75$

$x = 3.75$ Stick 3.75, gloves \$13.27

3. $\frac{100}{150} = \frac{1}{x}$

$100x = 150$

$x = 1.5$

One aspirin is $1\frac{1}{2}$ cents

4. $x + 2x = 168$

$3x = 168$

$x = 56$ Bill 112, Henry 56

D. 1. 5

2. 7

3. 6

4. 40

5. 3

6. 18

7. 47

8. 8

9. 9

10. 13

11. 11

ANSWER TO RIDDLE: A real smart cookie

RATE. RATIO
&
PERCENT

LEVEL 8

UNIT V

CONTENTS

Unit V - Rate, Ratio & Percent

PAGE

OBJECTIVE 1: Maintain previously developed skills and ideas: change fractions to an equivalent fraction whose denominator is 100. Express rates and ratios in the form $\frac{a}{b}$. Find the missing component. .... 497.

OBJECTIVE 3: Convert fractions to percent. .... 500.

OBJECTIVE 4: Convert percent to fractions. .... 502.

OBJECTIVE 5: Convert decimals to percent. .... 504.

OBJECTIVE 6: Convert percent to decimals. .... 506.

KEY TO EXERCISES .... 509.

Change the following fractions to equivalent fractions whose denominator is 100.

1. $\dfrac{9}{10} \overset{\times 10}{\underset{\times 10}{=}} \dfrac{90}{100}$

2. $\dfrac{19}{20} \overset{\times 5}{\underset{\times 5}{=}} \dfrac{\quad}{100}$

3. $\dfrac{7}{25} \overset{\times 4}{\underset{\times 4}{=}} \dfrac{\quad}{100}$

4. $\dfrac{3}{10} \overset{\times 10}{\underset{\times 10}{=}} \dfrac{\quad}{100}$

5. $\dfrac{3}{20} \overset{\times 5}{\underset{\times 5}{=}} \dfrac{\quad}{100}$

6. $\dfrac{41}{50} \overset{\times ?}{\underset{\times ?}{=}} \dfrac{\quad}{100}$

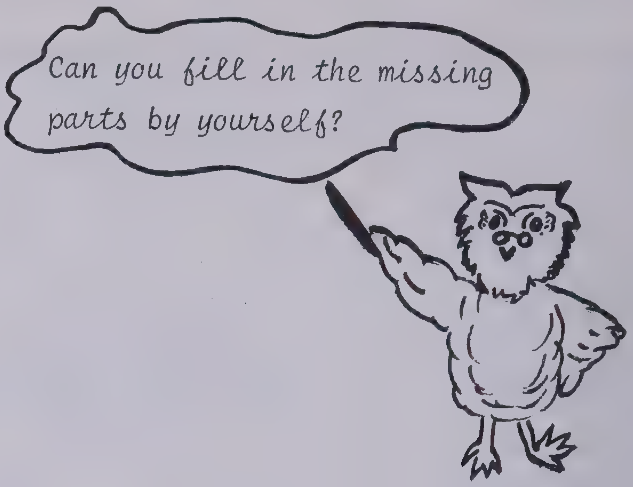
7. $\dfrac{6}{10} \overset{\times ?}{\underset{\times ?}{=}} \dfrac{\quad}{100}$

8. $\dfrac{1}{10} \overset{\times ?}{\underset{\times ?}{=}} \dfrac{\quad}{100}$

9. $\dfrac{6}{10} \overset{\times ?}{\underset{\times ?}{=}} \dfrac{\quad}{100}$

10. $\dfrac{13}{100} \overset{\times ?}{\underset{\times ?}{=}} \dfrac{\quad}{100}$

Multiply the numerator and the denominator by the same number so that the denominator is 100.


Can you fill in the missing parts by yourself?

11. $\frac{27}{50} = \frac{\quad}{100}$

12. $\frac{3}{20} = \frac{\quad}{100}$

13. $\frac{17}{20} = \frac{\quad}{100}$

14. $\frac{11}{50} = \frac{\quad}{100}$

15. $\frac{4}{25} = \frac{\quad}{\quad}$

16. $\frac{21}{25} = \frac{\quad}{\quad}$

17. $\frac{12}{25} = \frac{\quad}{\quad}$

18. $\frac{1}{2} = \frac{\quad}{\quad}$

19. $\frac{1}{4} = \frac{\quad}{\quad}$

20. $\frac{4}{5} = \frac{\quad}{\quad}$

Write the ratio of the sale price to the old price as a fraction $\frac{a}{b}$.

" *BOUTIQUE SALE* "

close-out SALE

PERMIT NO.999

prices slashed!

REDUCTIONS NO LESS THAN **75%**

YOU CAN BUY A 120.00 COAT FOR 40^{00}

YOU CAN BUY A 75.00 DRESS FOR 20^{00}

YOU CAN BUY A 45.00 PANT FOR 15^{00}

YOU CAN BUY A 60.00 PANT SUIT FOR 20^{00}

YOU CAN BUY A 90.00 SKIRT SET FOR 30^{00}

YOU CAN BUY A 60.00 GOWN FOR 20^{00}

purple
parrot
boutique

Change the following fractions to equivalent percents.

Example 1: $\underset{\boxed{\times 20}}{\overset{\boxed{\times 20}}{\frac{2}{5} \;=\; \frac{40}{100}}} = \underline{40\%}$

REMEMBER!

1. Change the fraction to an equivalent one with a denominator of 100.
2. The numerator of the new fraction is the %.

1. $\frac{30}{50} = \frac{\_\_\_}{100} = \_\_\_\%$

2. $\frac{20}{25} = \frac{\_\_\_}{100} = \_\_\_\%$

3. $\frac{10}{20} = \frac{\_\_\_}{100} = \_\_\_\%$

4. $\frac{10}{50} = \_\_\_\%$

5. $\frac{13}{10} = \_\_\_\%$

6. $\frac{4}{5} = \_\_\_\%$

7. $\frac{5}{5} = \_\_\_\%$

8. $\frac{1}{2} = \_\_\_\%$

9. $\frac{7}{20} = \_\_\_\%$

10. $\frac{4}{50} = \_\_\_\%$

11. $\frac{5}{25} = \_\_\_\%$

12. $\frac{9}{10} = \_\_\_\%$

13. $\frac{19}{20} = \_\_\_\%$

14. $\frac{57}{100} = \_\_\_\%$

15. $\frac{41}{50} = \_\_\_\%$

16. $\frac{3}{10} = \_\_\_\%$

17. $\frac{3}{4} = \_\_\_\%$

18. $\frac{1}{5} = \_\_\_\%$

19. $\frac{12}{25} = \_\_\_\%$

20. $\frac{23}{50} = \_\_\_\%$

"FIND THE MESSAGE"

"Math teachers never die, ____ ____ ____ ____   ____ ____ ____ ____
37% 10% 40% 15%   4% 20% 225% 37%

____ ____ ____ ____ ____ ____   ____ ____
68% 40% 50% 20% 150% 40%   37% 14%

____ ____ ____ ____ ____ ____ ____ ____   ____ ____ ____ ____."
225% 75% 5% 120% 95% 40% 225% 37%   24% 14% 68% 5%

To find out what happens to math teachers when they die, complete the following table and put the right letter with the answer above.

FRACTION IN SIMPLEST FORM	EQUIVALENT FRACTION OUT OF 100	PERCENT
$\frac{1}{10}$		(H)
$\frac{1}{5}$		(U)
$\frac{2}{5}$		(E)
$1\frac{1}{2}$		(C)
$1\frac{1}{5}$		(P)
$\frac{37}{100}$		(T)
$\frac{1}{2}$		(D)
$\frac{17}{25}$		(R)
$2\frac{1}{4}$		(S)
$\frac{3}{20}$		(Y)
$\frac{3}{4}$		(I)
$\frac{7}{50}$		(O)
$\frac{1}{20}$		(M)
$\frac{6}{25}$		(F)
$\frac{19}{20}$		(L)
$\frac{1}{25}$		(J)

EXERCISES UNIT V OBJECTIVE NO. 4

A. Convert the following percents to fractions whose denominators are 100.

1. Example: $55\% = \frac{55}{100}$
2. 17% = ____
3. 23% = ____
4. 97% = ____
5. 13% = ____
6. 39% = ____
7. 81% = ____
8. 93% = ____
9. 3% = ____
10. 77% = ____

REMEMBER !!! --- 1. Change % to "out of 100".
2. Simplify by dividing both numerator and denominator by the same factor.

B. Convert the following to fractions and then simplify.

1. Example: $20\% = \frac{20}{100} = \frac{1}{5}$
2. 50% = ____
3. 75% = ____
4. 30% = ____
5. 65% = ____
6. 36% = ____
7. 98% = ____
8. 80% = ____
9. 25% = ____
10. 88% = ____
11. 44% = ____
12. 60% = ____
13. 56% = ____
14. 22% = ____
15. 70% = ____
16. 3% = ____

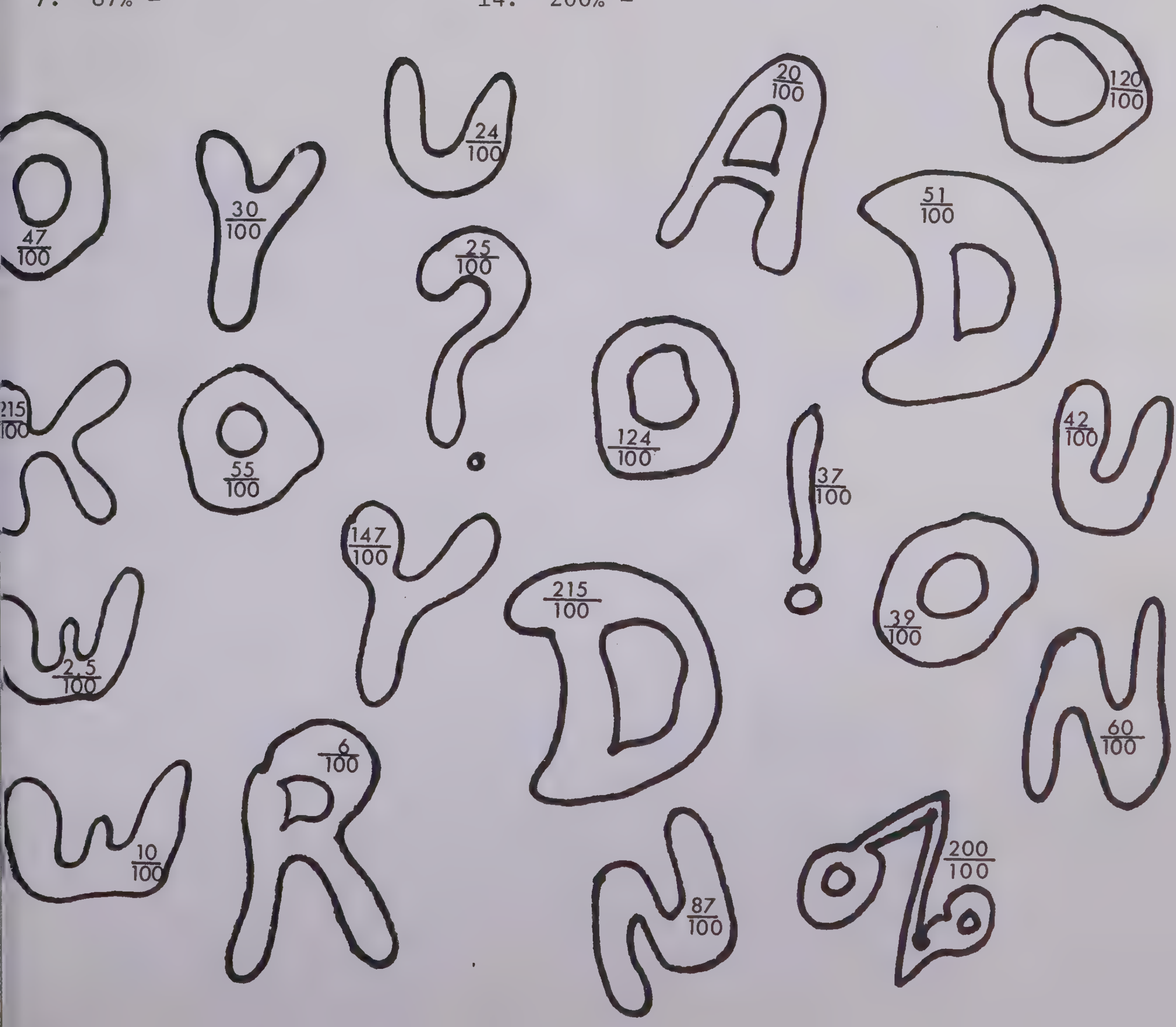
A % QUESTION ???

Change the following percents to fractions whose denominators are 100 and locate the answers below. Shade in the letters that contain the answers. If your work is correct, you will be asked a very important question.

1 ____ 2 ____   3 ____ 4 ____ 5 ____   6 ____ 7 ____ 8 ____ 9 ____

10 ____ 11 ____ 12 ____ 13 ____   14 ____   15 ____

1. 51% =
2. 47% =
3. 147% =
4. 39% =
5. 24% =
6. 215% =
7. 87% =
8. 124% =
9. 10% =
10. 30% =
11. 120% =
12. 42% =
13. 6% =
14. 200% =
15. 25% =



Change the following decimals to percents.

Example 1: 0.17 is equivalent to what percent?

Solution: $0.\underset{\curvearrowright}{17} = 17.0\%$ or 17%.

Example 2: 0.3 is equivalent to what percent?

Solution: $0.3 = 0.\underset{\curvearrowright}{30} = 30.0\%$ or 30%.

1. 0.19

2. 0.99

3. 0.65

4. 0.67

5. 0.3

6. 0.05

7. 0.8

8. 0.75

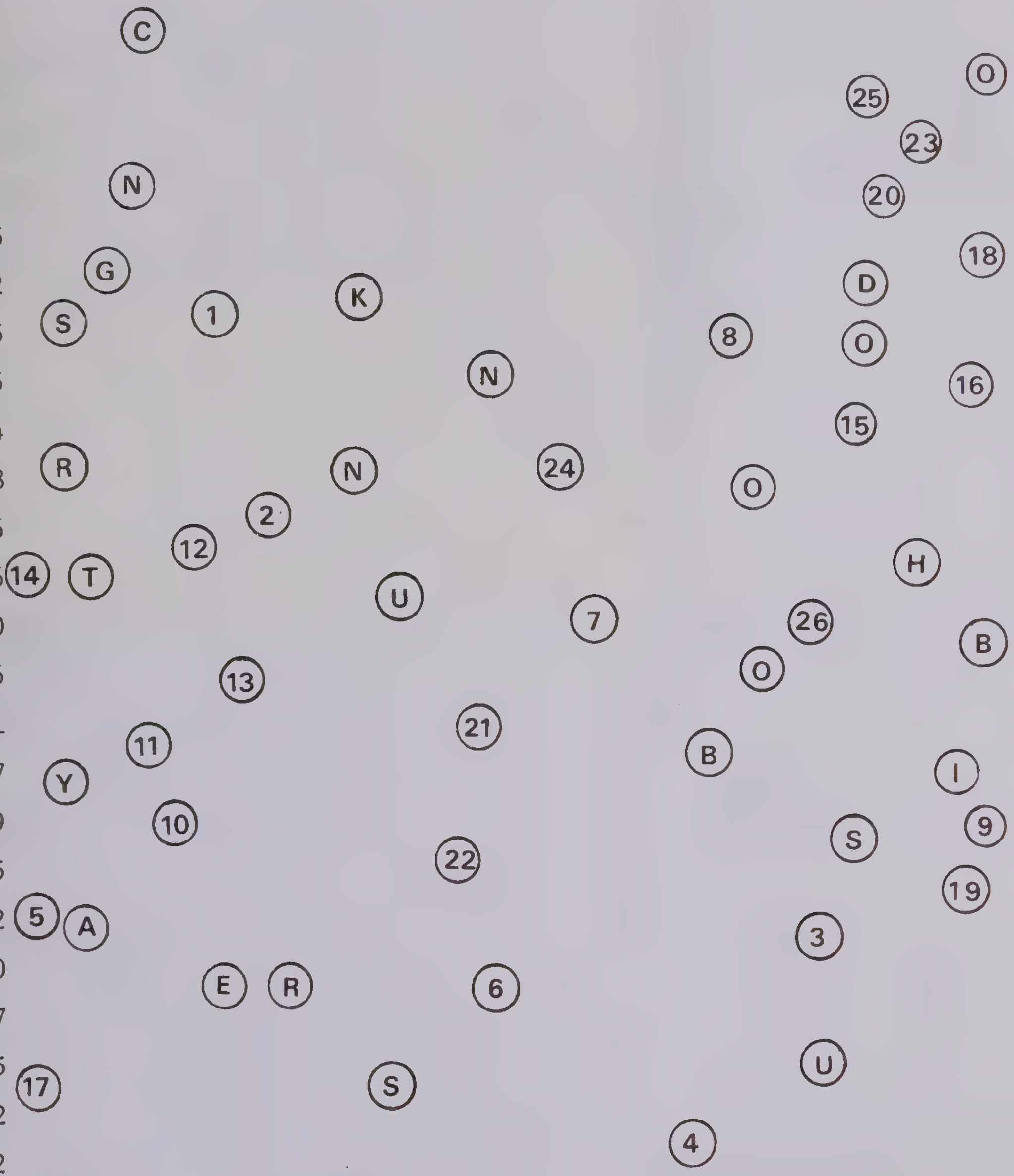
9. 1.02

10. 0.35

What do we say about a rabbit with an eating problem??

To find out, follow these directions. Change the decimals on the left to an equivalent percent. Join the matching pairs below with a straight line. The circled letter is placed above the circled number on the line below.

0.5	90%
0.7	56%
0.1	28%
0.4	612%
0.3	95%
0.25	50%
0.42	14%
0.75	62%
0.55	100%
0.14	140%
0.28	30%
0.46	55%
0.56	46%
0.90	22%
0.36	36%
3.21	42%
0.77	69%
0.69	77%
4.15	321%
0.22	25%
1.40	70%
0.87	75%
0.95	10%
6.12	415%
0.62	40%
1.00	87%



___ ___ ___ ___   ___ ___ ___ ___ ___   ___ ___
1 2 3 4   5 6 7 8 9   10 11

___ ___ ___ ___ ___ ___   ___ ___   ___ ___ ___ ___ ___ ___ ___
12 13 14 15 16 17   18 19   20 21 22 23 24 25 26

Change the following percents to decimals.

Example 1: $50\% = \underset{\curvearrowleft}{50.}$
$= 0.50$

Example 2: $205\% = \underset{\curvearrowleft}{205.}$
$= 2.05$

1. 10%

2. 25%

3. 75%

4. 80%

5. 95%

6. 120%

7. 200%

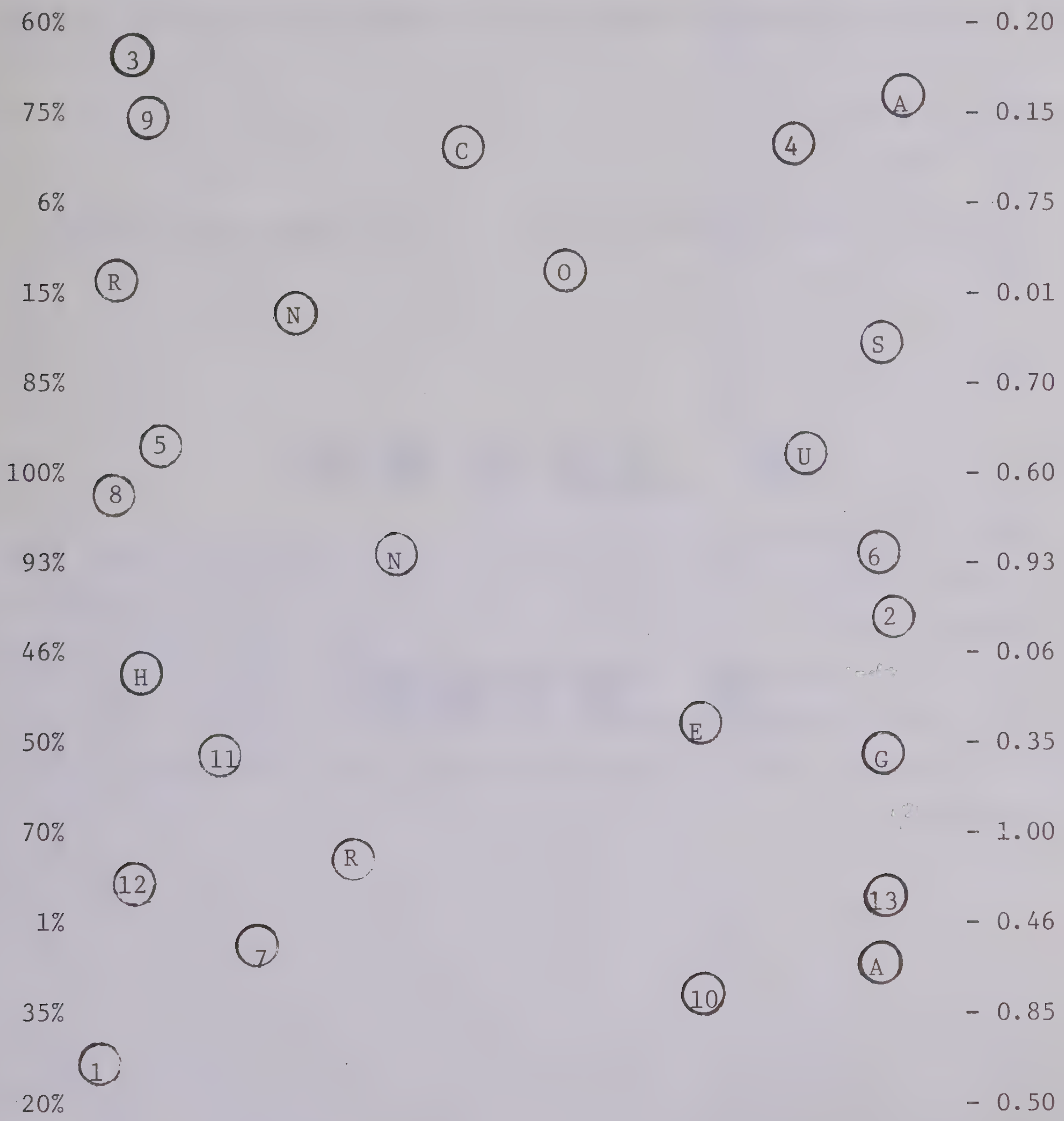
8. 100%

9. 90%

10. 8%

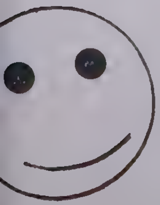
WHAT DO WE CALL IT IF A PERSON IS IN LOVE WITH A CITRUS FRUIT?

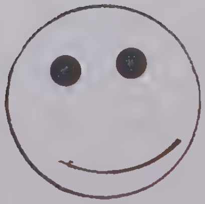
To find the answer, follow these directions. Change the percents on the left to their equivalent decimals. Join the percents to their equivalent decimals, which appear on the right, with a straight line. Place the circle letter above the circle number on the line below.



1 2 3 4 5 6 7 8

9 10 11 12 13





Flashcard

Make a number of equalities and inequalities on cards. One better student flashes cards, and players respond wrong or right. First player getting the card correct gets the card. Winner holds the most cards.

Example: 50% = 0.50 or 100% = 1.00

Game can be varied by having percentage on the cards and seeking the decimal value.

Example: 20% = .___

25% = .___

Again, the first correct response gets the card. The winner holds the most cards.

Baseball

Make a number of equalities and inequalities on cards as in above game. One student is designated as pitcher. The pitcher calls the card. The correct answer advances to first base, next correct answer pushes the runner onward. Three errors and the side is out. The designated caller attempts to get the other team to commit three errors and thus put the other team out. All questions are placed on the cards and the pitcher selects the curves (cards) to fan the batter.

KEY TO EXERCISES

LEVEL 8

UNIT V

RATE, RATIO & PERCENT

KEY TO EXERCISES

Objective No. 1

2. 95
3. 28
4. 30
5. 15
6. 82
7. 60
8. 10
9. 60
10. 13
11. 54
12. 15
13. 85
14. 22
15. $\frac{16}{100}$
16. $\frac{84}{100}$
17. $\frac{48}{100}$
18. $\frac{50}{100}$
19. $\frac{25}{100}$
20. $\frac{80}{100}$

"BOUTIQUE SALE":

Coat	$\frac{40}{120}$
Dress	$\frac{25}{75}$
Pant	$\frac{15}{45}$
Pant Suit	$\frac{20}{60}$
Skirt Set	$\frac{30}{90}$
Gown	$\frac{20}{60}$

Objective No. 3

1. 30; 30
2. 80; 80
3. 50; 50
4. 200
5. 130
6. 80
7. 100
8. 50
9. 35
10. 8
11. 20
12. 90
13. 95
14. 57
15. 82
16. 30
17. 75
18. 20
19. 48
20. 46

"FIND THE MESSAGE:

"Math teachers never die, they just reduce to simplest form."

Objective No. 4

A.
2. $\frac{17}{100}$
3. $\frac{23}{100}$
4. $\frac{97}{100}$
5. $\frac{13}{100}$
6. $\frac{39}{100}$
7. $\frac{81}{100}$
8. $\frac{93}{100}$
9. $\frac{3}{100}$
10. $\frac{77}{100}$

Key to Exercises

Objective No. 4

B.

2. $\frac{50}{100} = \frac{1}{2}$
3. $\frac{75}{100} = \frac{3}{4}$
4. $\frac{30}{100} = \frac{3}{10}$
5. $\frac{65}{100} = \frac{13}{20}$
6. $\frac{36}{100} = \frac{9}{25}$
7. $\frac{98}{100} = \frac{49}{50}$
8. $\frac{80}{100} = \frac{4}{5}$
9. $\frac{25}{100} = \frac{1}{4}$
10. $\frac{88}{100} = \frac{22}{25}$
11. $\frac{44}{100} = \frac{11}{25}$
12. $\frac{60}{100} = \frac{3}{5}$
13. $\frac{56}{100} = \frac{14}{25}$
14. $\frac{22}{100} = \frac{11}{50}$
15. $\frac{70}{100} = \frac{7}{10}$
16. $\frac{3}{100}$

A % Question:

"Do you know your %?"

Objective No. 5

1. 19%
2. 99%
3. 65%
4. 67%
5. 30%
6. 5%
7. 80%
8. 75%
9. 102%
10. 35%

"What do we say about a rabbit with an eating problem?"

"Bugs Bunny is hooked on carrots."

Objective No. 6

1. 0.10
2. 0.25
3. 0.75
4. 0.80
5. 0.95
6. 1.20
7. 2.00
8. 1.00
9. 0.90
10. 0.08

"What do we call it if a person is in love with a citrus fruit?"

"An orange crush."

EXPONENTS

LEVEL 8

UNIT VI

CONTENTS

Unit VI - Exponents

PAGE

OBJECTIVE 1: Use the terms base, power, exponent, squared, cubed and to the n^{th} power. .... 515.

OBJECTIVE 3: Write the values for powers. (Limit: bases - rational numbers, exponents- whole numbers.) .... 518.

OBJECTIVE 6: Simplify and evaluate expressions using the following properties. (Limit: bases - rational numbers, exponents - integers.) .... 527.

a. $x^a \times x^b = x^{a+b}$

b. $x^a \div x^b = x^{a-b}$

c. $x^a + x^b$

d. $x^a \times y^a$

KEY TO EXERCISES .... 535.

Exponents and Associates

In 5^4, 5 is called the base

9^2 can be read:
nine squared, or nine exponent two,
or nine to the power of two.

In 11^2, 11 is the base.

In 7^8, 8 is called the exponent or the power.

The exponent has the power to tell the base how many times it should be multiplied by itself.

19^3 can be read
nineteen exponent three
or nineteen to the power of three
or nineteen cubed.

8^3 means 8 x 8 x 8.
Eight is a factor three times.

4^n is read four the the power of n,
or four to the nth power.
n can be any whole number.

1. Write the words base or exponent beside each of the question that follow:

(a) 7 in 4^7 __________

(b) 5 in 5^4 __________

(c) 9 in 9^2 __________

(d) 3 in 8^3 __________

(e) 6 in 6^8 __________

(f) 17 in 17^9 __________

(g) 10 in 10^4 __________

(h) 5 in 7^5 __________

(i) 12 in 6^{12} __________

(j) 14 in 14^3 __________

2. A Prickly Problem:

"What did the porcupine say to the cactus? "

Answer the questions that follow. Then find your answer at the bottom of the page and place the letter of that question above the answer.

T The exponent in 5^4 is ____________.

S Which numeral in 7^9 tells how many times the base is used as a factor? ____________

Y The base in the expression 10 x 10 would be ____________.

A 7 to the power of one equals ____________.

H The exponent for the expression 4 x 4 x 4 x 4 x 4 x 4 would be ____________.

O Write the symbol in the expression 8^2 that one could read as 'squared' ____________

M The base in 12^4 is ____________

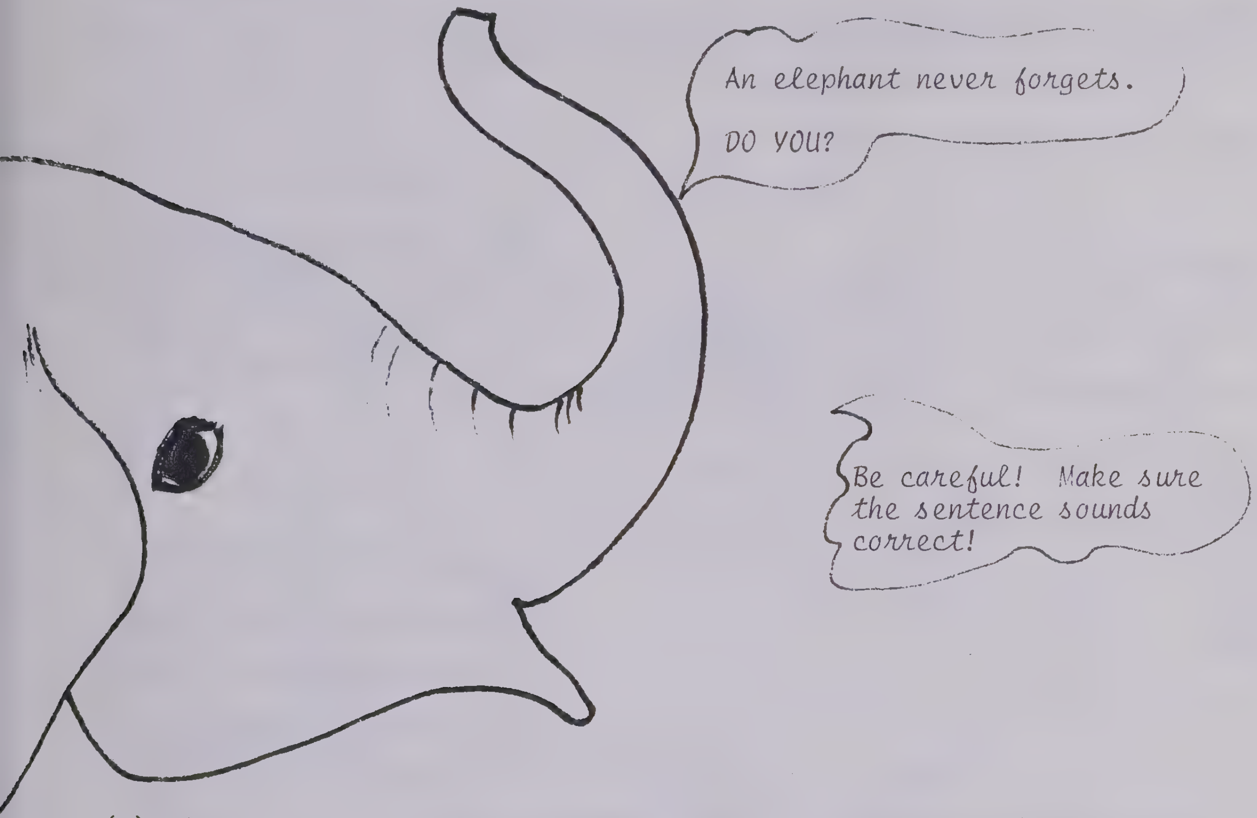
U The power in 9^5 is ____________

I Which symbol in 5^3 represents cubed? ____________

___ ___   ___ ___ ___ ___   ___ ___ ___   ___ ___ ___

3 9   4 6 7 4   10 2 5   12 2 12

3. Place the words exponent, base, power, squared, cubed and nth in the proper blanks.


An elephant never forgets.
DO YOU?
Be careful! Make sure the sentence sounds correct!

(a) An ____________ tells how many times the base is used as a factor.

(b) Another name for exponent is ______________.

(c) We would read 5^3 is 'five ______________'.

(d) 17^n means seventeen to the ___________ power.

(e) In 25^7, 25 is the _____________.

(f) $8^2 + 5^9$ would be read as eight __________ plus five to the _________ of nine.

(g) The __________in 100^3 is 3.

(h) 15^4 means the ___________ is a factor four times.

(i) We could read 98^2 as 'ninety-eight to the _________ of two' or 'ninety-eight ____________ two' or ninety-eight __________.

(j) If we want our exponent to be any number we use the symbol _________ to indicate this.

1. BLACK OUT:

Work out the answer to each of the questions below. Then find each answer on the Bingo Card below and mark it off by shading it. Your assignment is done when you get a blackout.

e.g. $2 \times 2 \times 2 \times 2 \times 2 = 2^5$ e.g. $4 \times 4 \times 4 = 4^3$

The exponent 3 tells how many times the base 4 is used as a factor.

(a) $2 \times 2 \times 2 =$ ______________

(b) $1 \times 1 =$ ______________

(c) $1 \times 1 \times 1 \times 1 \times 1 \times 1 =$ __________

(d) $3 \times 3 \times 3 \times 3 \times 3 =$ __________

(e) $8 \times 8 \times 8 \times 8 \times 8 =$ __________

(f) $7 \times 7 \times 7 =$ ______________

(g) $6 \times 6 \times 6 \times 6 =$ __________

(h) $10 \times 10 \times 10 \times 10 \times 10 =$ ________

(i) $13 \times 13 =$ ______________

(j) $14 \times 14 \times 14 \times 14 =$ __________

(k) $18 \times 18 \times 18 \times 18 =$ __________

(l) $17 \times 17 \times 17 \times 17 \times 17 =$ ________

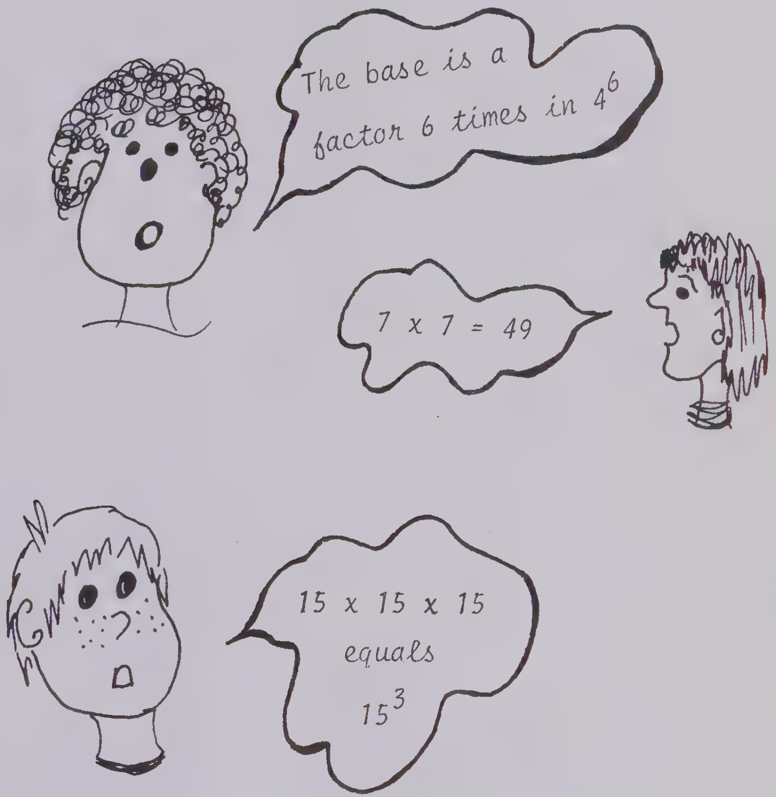
The exponent tells one how many times the base is used as a factor.

17^5	10^5	3^5
2^3	1^2	7^3
18^4	3^4	1^6

2. Cross out the letters beside each equation that is false. The letters that remain will spell the answer to the following riddle:

"What flowers do you wear all year long?"

K	$5^2 = 10$
N	$9^3 = 27$
T	$8^2 = 64$
C	$1^3 = 3$
D	$2^1 = 3$
R	$3^3 = 9$
W	$4^3 = 64$
O	$6^2 = 36$
N	$7^3 = 21$
J	$8^2 = 16$
L	$24^2 = 48$
Q	$11^2 = 22$
I	$36^2 = 1296$
F	$2^2 = 8$
P	$9^3 = 729$
G	$8^2 = 16$
S	$7^2 = 49$


The base is a factor 6 times in 4^6
$7 \times 7 = 49$
$15 \times 15 \times 15$ equals 15^3

3. A DRIVING TIP

Write the standard name for each of the following expressions. Then find your answer at the bottom of the page and place the letter of the question that corresponds to the answer above it. The decoded message will tell you - *HOW TO TOP A CAR.*

K = 5^3 = ________

I = 5^4 = ________

R = 1^8 = ________

O = 5^1 = ________

A = 10^2 = ________

N = 2^5 = ________

B = 3^2 = ________

E = 4^3 = ________

T = 7^3 = ________

D = 2^2 = ________

P = 6^6 = ________

H = 5^5 = ________

___ ___ ___ ___ ___ ___ ___ ___

343 64 46656 5 32 343 3125 64

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

9 1 100 125 64 343 5 5 46 656 625 4

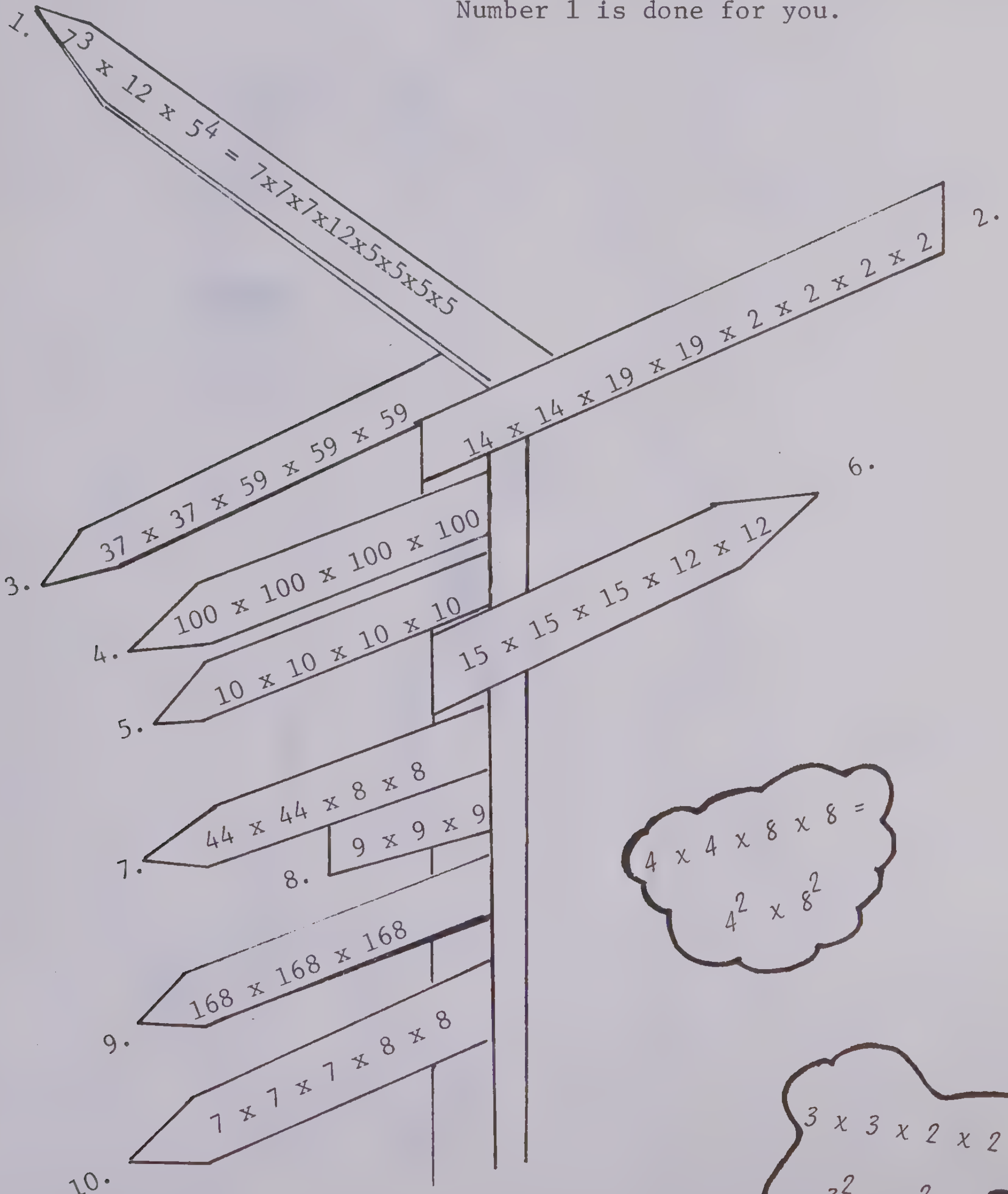
4.

WHERE ARE YOU GOING WITH EXPONENTS?

Exponential Notation - is a base and an exponent.
e.g. $5 \times 5 = 5^2$

$16 \times 16 \times 16 = 16^3$

Instructions: Use the exponential form to simplify the following multiplications. Number 1 is done for you.


1. $7^3 \times 12 \times 5^4 = 7x7x7x12x5x5x5x5$
2. 14 x 14 x 19 x 19 x 2 x 2 x 2 x 2
3. 37 x 37 x 59 x 59 x 59
4. 100 x 100 x 100 x 100
5. 10 x 10 x 10 x 10
6. 15 x 15 x 15 x 12 x 12
7. 44 x 44 x 8 x 8
8. 9 x 9 x 9
9. 168 x 168 x 168
10. 7 x 7 x 7 x 8 x 8

$4 \times 4 \times 8 \times 8 =$
$4^2 \times 8^2$

$3 \times 3 \times 2 \times 2 =$
$3^2 \times 2^2$

5.

PUPPIES HAVE PROBLEMS TOO

To decode the title of this picture find the standard name for each question around the picture. Then find your answer at the bottom of the page and match the letter of the question to it.

A. $8^3 + 3^3$

G. $7^3 + 5^3$

E. $6^3 + 11^2$

T. $3^6 + 4^2 + 2^3$

D. $5^4 + 3^2 + 2^4$

S. $4^4 + 2^3$

I. $9^3 + 5^4$

F. $12^2 + 15$

O. $10^5 + 10^3$

L. $15^2 + 10^3$

1354 753 ' 264 539 650 100 000 000 368 ' 264

1225 1354 159 337

6. MATCHMAKING RESULTS IN ___???___

Match the letter of each expression in Column B with its partner in Column A. Find the answer to the above question. (Some items in Column B may be used more than one time.)

COLUMN A

_____ 1. 6^6

_____ 2. 81 x 81 x 81

_____ 3. $\frac{-1}{7} \times \frac{-1}{7}$

_____ 4. one hundred twenty-five exponent four

_____ 5. five eighths square

_____ 6. $\frac{1}{9} \times \frac{1}{9} \times \frac{1}{9} \times \frac{1}{9} \times \frac{1}{9} \times \frac{1}{9} \times \frac{1}{9}$

_____ 7. (-5)x(-5)x(-5)x(-5)x(-5)x(-5)

_____ 8. fifty four to the power of four

_____ 9. five eights exponent two

_____ 10. ninety nine

_____ 11. ninety-nine to the power of one

_____ 12. 4^3

_____ 13. five eights to the power of two

_____ 14. $(\frac{1}{5})^4$

_____ 15. one hundred twenty five to the power of four

COLUMN B

g. $\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5}$

i. four cubed

r. 99

m. 54 x 54 x 54 x 54

l. 6 x 6 x 6 x 6 x 6 x 6

o. 81^3

n. $(\frac{1}{9})^7$

e. 125^4

a. $(\frac{+5}{8})^2$

d. $(-5)^6$

v. $(\frac{-1}{7})^2$

7. HOW DO YOU SHAPE UP?

Work out the value (standard name) for each of the following measurements:

(a)

I am $2^2 \times 5^2$ cm tall. My baseball bat is 3×5^2 cm long.

The little boy is ________ tall.

His bat is ________long.

(b) My measurements are:

$3^2 \times 2 \times 5$ cm, $2^2 \times 3 \times 5$ cm,

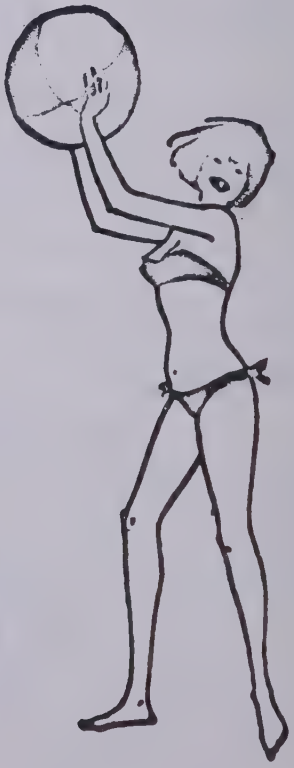
$3^2 \times 2 \times 5$ cm.

My height is $2^5 \times 5$ cm.

The lady's measurements are

________, __________. ________.

The lady's height is__________.



7. (c)

I am a basketball player.

I am $2^3 \times 5^2$ cm tall.

My legs are 19 x 5 cm long.

My weight is 2 x 5 x 7 kg.

The circumference of the basketball is $2^2 \times 19$ cm.

Height ________________

Leg Length ______________

Weight _________________

Circumference of the basketball

____

8.

I am a weight lifter...

my chest measures 3 x 5 x 7 cm

my waist measures $2 \times 3^3 \times 5$ cm

my hips measure $2^5 \times 3$ cm.

I am 2 x 5 x 19 cm tall.

The circumference of my muscle-bound arm is $2^3 \times 5$.

Chest ____________

Waist ____________

Hips ____________

Height ___________

Circumference of arm ___________

9. How do you shape up? Write out your measurements in exponential notation and in standard name.

	Exponential Notation	Standard Name
Neck		
Waist		
Hips		
Height		

10. EXPONENTS ARE FUN!

Write a name in exponential notation for each of the following:

Expressions in EXPONENTIAL NOTATION require a base and an exponent.

(a) $(\frac{2}{3}) \times (\frac{2}{3}) \times (\frac{2}{3}) \times (\frac{2}{3}) =$ ____________

(b) $(\frac{1}{2}) \times (\frac{1}{2}) =$ ____________

(c) $(\frac{7}{3}) =$ ____________

(d) $(\frac{-1}{3}) \times (\frac{-1}{3}) \times (\frac{-1}{3}) \times (\frac{-1}{3}) =$ ________

(e) $(-8) \times (-8) \times (-8) \times (-8) \times (-8) =$ ______

(f) $(\frac{1}{10}) \times (\frac{1}{10}) \times (\frac{1}{10}) \times (\frac{1}{10}) \times (\frac{1}{10}) \times (\frac{1}{10}) =$ ______

(g) $(\frac{-2}{7}) \times (\frac{-2}{7}) \times (\frac{-2}{7}) =$ ______

(h) $(\frac{15}{8}) \times (\frac{15}{8}) \times (\frac{15}{8}) \times (\frac{15}{8}) \times (\frac{15}{8}) =$ ______

(i) $(\frac{-1}{4}) \times (\frac{-1}{4}) \times (\frac{-1}{4}) \times (\frac{-1}{4}) \times (\frac{-1}{4}) \times (\frac{-1}{4}) =$ _____

(j) $(\frac{6}{5}) \times (\frac{6}{5}) \times (\frac{6}{5}) =$ ______

Any number to the power of one equals itself.

LET'S SIMPLIFY:

e.g. $5^2 \times 5^4 \times 5^{10} = 5^{2+4+10}$ or 5^{16}

$n^3 \times n^4 \times n^8 \times n^3 = n^{3+4+8+3}$ or n^{18}

$y^2 \times 6^3 \times y^4 \times 6^8 \times y^5 = y^{2+4+5} \times 6^{3+8} = y^{11} \times 6^{11}$

1. Simplify each of the following in the fashion illustrated above.

(a) $8^4 \times 8^3 \times 8^7 =$ ____________________

(b) $a^5 \times x^4 \times a^2 \times x^1 =$ ____________________

(c) $h^2 \times k^3 \times k^5 \times h^8 =$ ____________________

(d) $2^4 \times 2^5 \times 2^8 \times b^4 \times b^6 =$ ____________________

(e) $4^8 \times z^5 \times 3^9 \times 4^6 \times z^1 \times 3^3 =$ ____________________

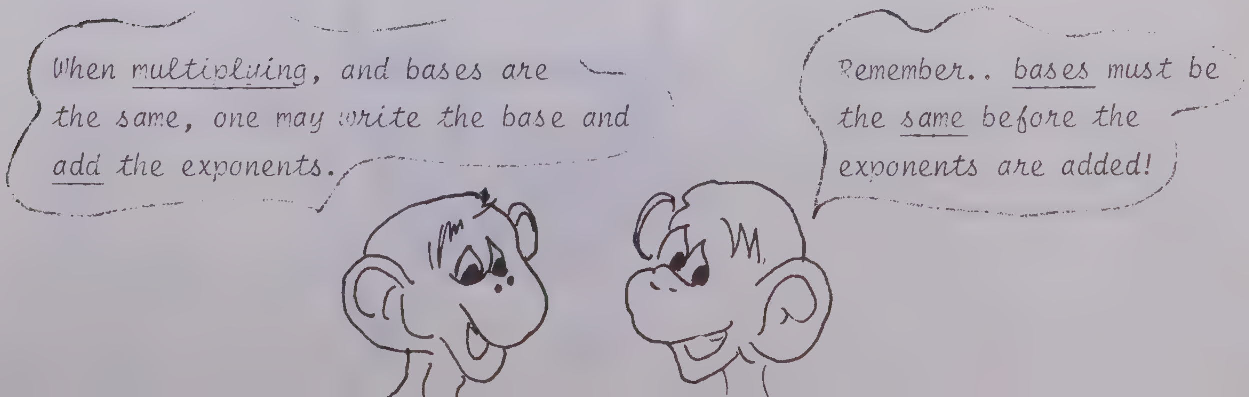
(f) $-m^4 \times n^8 \times -m^4 \times -m^{10} \times n^6 =$ ____________________

(g) $b^5 \times x^8 \times b^{10} \times x^5 =$ ____________________

(h) $7^8 \times 15^2 \times 7^{10} \times 15^8 =$ ____________________

(i) $100^2 \times c^4 \times 100^4 \times c^1 =$ ____________________

(j) $10^5 \times h^3 \times 10^2 \times y^7 \times 8^3 \times y^1 =$ ____________________


When multiplying, and bases are the same, one may write the base and add the exponents.
Remember.. bases must be the same before the exponents are added!

LET'S GET SIMPLE AGAIN:

e.g. $x^{-2} \times x^{-5} = x^{-2 + -5} = x^{-7}$

$y^{-5} \times y^{3} = y^{-5 + 3} = y^{-2}$

$7^{-2} \times z^{6} \times 7^{5} \times z^{-5} = 7^{-2 + 5} \times z^{6 + -5} = 7^{3} \times z^{1}$

2. Write simplest exponential notation for each of the following.

(a) $a^{5} \times b^{-2} \times a^{-8} \times b^{-8} =$ ____________________

(b) $6^{4} \times d^{10} \times 6^{-4} \times d^{-4} =$ ____________________

(c) $z^{12} \times m^{3} \times m^{-12} \times z^{-2} \times z^{-5} =$ ____________________

(d) $-10^{12} \times -10^{7} \times -10^{-20} \times -10^{35} =$ ____________________

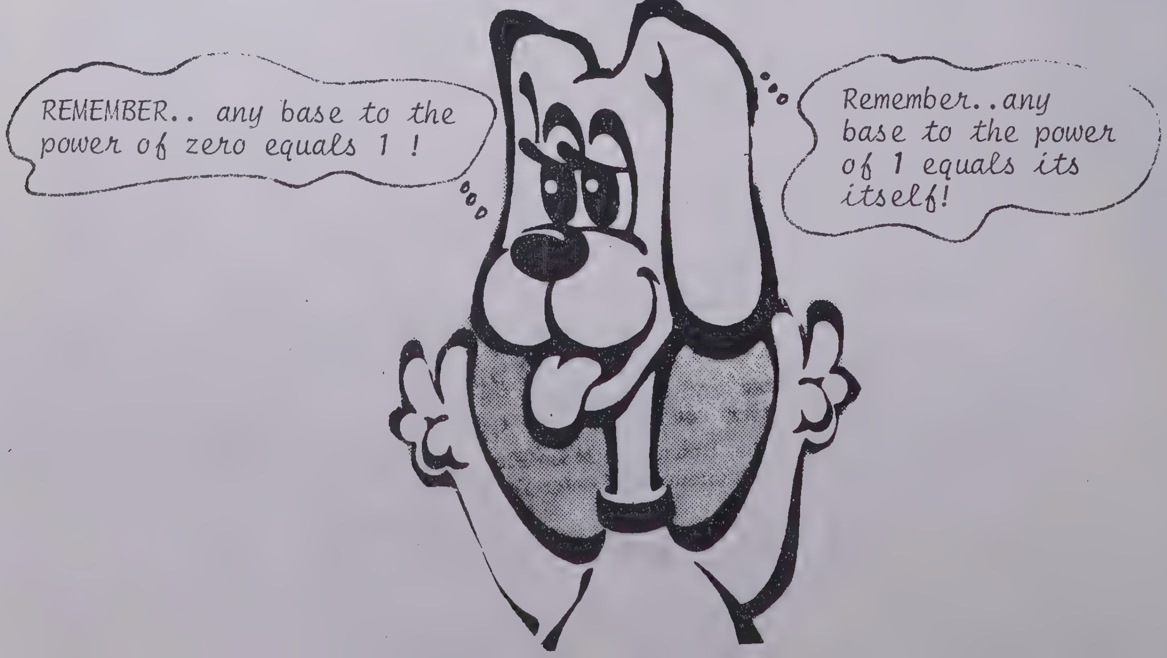
(e) $\frac{5^{3}}{4} \times \frac{5^{-8}}{4} =$ ____________________

(f) $\frac{7^{2}}{3} \times \frac{7^{6}}{3} \times \frac{7^{-5}}{3} =$ ____________________

(g) $\frac{5^{-2}}{8} \times \frac{5^{1}}{8} \times \frac{5^{4}}{8} =$ ____________________

(h) $y^{5} \times z^{-8} \times z^{-10} \times y^{-5} =$ ____________________

(i) $100^{-9} \times 100^{10} =$ ____________________


REMEMBER.. any base to the power of zero equals 1 !
Remember..any base to the power of 1 equals its itself!

3. CAN YOU FIND THE TITLE TO THIS PICTURE?

Work out the answer in simplest exponential notation. Then find the answer below each space in the title of the picture and write the letter that corresponds to the answer above it.

(a) L $x^5 \div x^3 =$ ______________________

(b) E $x^{10} \div x^2 =$ ______________________

(c) T $x^8 \div x^1 =$ ______________________

(d) N $x^2 \div x^2 =$ ______________________

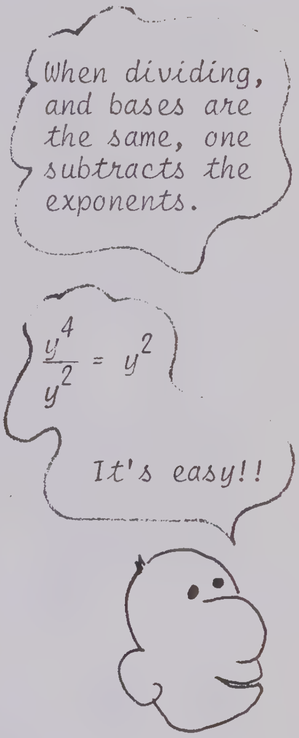
(e) D $x^8 \div x^4 =$ ______________________

(f) I $x^{15} \div x^{10} =$ ______________________

(g) A $x^9 \div x^8 =$ ______________________

(h) D $x^6 \div x^2 =$ ______________________

(i) B $x^{12} \div x^6 =$ ______________________


When dividing, and bases are the same, one subtracts the exponents.
$\frac{y^4}{y^2} = y^2$
It's easy!!

x^1

x^6 x^2 x^5 x^0 x^1

x^4 x^1 x^7 x^8

4. Write the simplest exponential notation for each of the following:

(e.g. $\frac{2^{10}}{2^6} = 2^{10-6} = 2^4$, $\frac{9^2}{9^3} = 9^{2-3} = 9^{-1}$

(a) $\frac{2^5}{2^3} =$ ____________________

(b) $\frac{8^9}{8^7} =$ ____________________

(c) $\frac{n^5}{n^6} =$ ____________________

(d) $\frac{x^{12}}{x^{11}} =$ ____________________

(e) $\frac{m^5 \times n^9}{m^3 \times n^{12}} =$ ____________________

(f) $\frac{a^4 \times b^{10}}{a^4 \times b^6} =$ ____________________

(g) $\frac{15^4}{15^{10}} =$ ____________________

(h) $\frac{y^4 \times z^{15}}{y^{10}} =$ ____________________

(i) $\frac{x^2 \times y^2 \times z^2}{x \times y \times z} =$ ____________________

5. "WHY DO RADIO ANNOUNCERS HAVE SMALL HANDS?"

To find the answer write the simplest notation for each of the following. Then find the answer at the bottom of the page and place the letter associated with that answer above it.

n $7^5 \times 7^{-10} =$ ______

c $2^{12} \div 2^{20} =$ ______

d $n^{-8} \times n^{12} =$ ______

f $(\frac{2}{3})^5 \times (\frac{2}{3})^7 =$ ______

r $-y^7 \times -y^{-18} =$ ______

Use me first.

w $2^5 \times n^{12} \times 2^4 \times n^{-15} =$ ______

p $(\frac{1}{2})^2 \div (\frac{1}{2})^1 =$ ______

e $z^{-12} \times z^{36} =$ ______

Use me later in the answer

w $b^{10} \div b^{-6} =$ ______

s $9^{12} \times 9^{14} \times 9^2 =$ ______

i $(4^5 \times 4^9) \div 4^{12} =$ ______

t $x^{25} \times x^{-13} =$ ______

o $17^5 \div 17^{10} =$ ______

a $z^0 \times z^{-4} =$ ______

______ ______ ______ ______ ______ ______ ______ ______ ______ ______

$2^9 \times n^{-3}$ z^{24} z^{24} $(\frac{1}{2})^1$ z^{-4} b^{16} 9^{28} $(\frac{2}{3})^{12}$ 17^{-5} $-y^{-11}$

______ ______ ______ ______ ______ ______ ______ ______ ______ ______ ______ ______ ______ ______

4^2 n^4 z^{24} 7^{-5} x^{12} 4^2 $(\frac{2}{3})^{12}$ 4^2 2^{-8} z^{-4} x^{12} 4^2 17^{-5} 7^{-5}

FINDING THE VALUE

Expressions in exponential notation can be changed to standard numerals.

e.g. $5^2 = 5 \times 5 = 25$

$$5^{-2} = \frac{1}{5} \times \frac{1}{5} = \frac{1}{25}$$

$$3^3 \times 7^{-2} = 3 \times 3 \times 3 \times \frac{1}{7} \times \frac{1}{7} = \frac{27}{49}$$

$$\left(\frac{-1}{2}\right)^2 \times 5^{-4} = \left(\frac{-1}{2}\right) \times \left(\frac{-1}{2}\right) \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} = \frac{1}{2500}$$

6. Change each of the following to standard numeral.

(a) $8^3 =$ ____________________

(b) $7^{-2} \times 5^4 =$ ____________________

(c) $\left(\frac{1}{3}\right)^3 \times 6^2 =$ ____________________

(d) $(-5)^3 \times 2^{-4} =$ ____________________

(e) $10^{-3} \times 6^{-2} =$ ____________________

(f) $15^3 \times \left(\frac{1}{5}\right)^4 =$ ____________________

(g) $12^{-4} \times 7^3 =$ ____________________

(h) $-50^2 \times 9^{-4} =$ ____________________

(i) $17^3 \times 8^{-3} =$ ____________________

(j) $4^6 \times 7^{-4} \times 11^2 =$ ____________________

7. LET'S TACKLE SOME TOUGHIES!

Find the value of each of the following. Write the answer as a standard numeral.

e.g. $\frac{5^4}{5^2} = 5^2 = 5 \times 5 = 25$

$$\frac{7^{-5}}{7^{-2}} = 7^{-5 - -2} = 7^{-5+2} = 7^{-3} = \frac{1}{7} \times \frac{1}{7} \times \frac{1}{7} = \frac{1}{343}$$

(a) $\frac{2^5}{2^7} =$ ____________________

(b) $\frac{10^4}{10^{-2}} =$ ____________________

(c) $\frac{5^{-3}}{5^1} =$ ____________________

(d) $15^{-2} \div 15^{-4} =$ ____________________

(e) $6^{-8} \div 6^{-5} =$ ____________________

(f) $(\frac{1}{5})^{12} \div (\frac{1}{5})^9 =$ ____________________

(g) $(-12)^{10} \div (-12)^8 =$ ____________________

(h) $(-3)^5 \div (-3)^1 =$ ____________________

(i) $125^{-5} \div 125^{-5} =$ ____________________

(j) $(\frac{3}{14})^{-8} \div (\frac{3}{14})^{-10} =$ ____________________

ACTIVITY UNIT VI OBJECTIVE NO. 1, 3, 6

SOLITAIRE GAME

Purpose: To provide practice in converting exponential form to standard form.

Materials: 3 decks of 52 cards each, each deck a different color:
1 deck of exponential form cards
1 deck of standard form cards (equivalent to exponential form cards)
1 deck of relationship symbols (consisting of these four symbols: $=$, $\neq$, $>$, $<$, each symbol being represented 13 times in the deck)

Rules:

1. One player at a time.
2. The player shuffles each deck and lays them facedown on the table. He then turns the top card on each deck. If the mathematical sentence is true, he wins a point. If not, he does not win a point. For example, in (a) $2^3 = 8$, so he puts these three cards into the "won" pile. In (b) $3^2 < 16$ so those three cards also go into the "won" pile. In (c) $4^3 \neq 64$, the statement is false, and he must put these three cards into the "lost" pile. In (d) $5^2 > 36$, the statement is false, and these three cards go into the "lost" pile. He goes through the "won" deck and counts his score.
3. The game may be played in groups. The player that reaches the score of 50 first is the winner.

KEY TO EXERCISES

LEVEL 8

UNIT VI

EXPONENTS

KEY TO EXERCISES

Objective No. 1

1. (a) exponent
   (b) base
   (c) base
   (d) exponent
   (e) base
   (f) base
   (g) base
   (h) exponent
   (i) exponent
   (j) base

2. A Prickly Problem: "Is that you mom?"

T = 4
S = 9
Y = 10
A = 7
H = 6
O = 2
M = 12
U = 5
I = 3

3. (a) exponent
   (b) power
   (c) cubed
   (d) nth
   (e) base
   (f) squared, power
   (g) exponent or power
   (h) base
   (i) power, exponent, squared
   (j) nth

Objective No. 3

1. (a) 2^3
   (b) 1^2
   (c) 1^6
   (d) 3^5
   (e) 8^5
   (f) 7^3
   (g) 6^4
   (h) 10^5
   (i) 13^2
   (j) 14^4
   (k) 18^4
   (l) 17^5

Key to Exercises

Objective No. 3 - continued

2. What flowers do you wear all year long? "Two lips" (Tulips)

3. A Driving Tip: "Tep on the brake toopid!"

K = 125
I = 625
R = 1
O = 5
A = 100
N = 32
B = 9
E = 64
T = 343
D = 4
P = 46656
H = 3125

4. Where are you going with exponents?

(a) $7^3 \times 12 \times 5^4$
(b) $14^2 \times 19^2 \times 2^4$
(c) $37^2 \times 59^3$
(d) 100^4
(e) 10^4
(f) $15^3 \times 12^2$
(g) $44^2 \times 8^2$
(h) 9^3
(i) 168^3
(j) $7^3 \times 8^2$

5. Puppies have problems too! "It's a dog's life."

I = 1354
T = 753
S = 264
A = 539
D = 650
O = 100 000 000
G = 368
L = 1225
F = 159
E = 337

Objective No. 3 - continued

6. Matchmaking results in "love and marriage."

l 1.
o 2.
v 3.
e 4.

a 5.
n 6.
d 7.

m 8.
a 9.
r 10.
r 11.
i 12.
a 13.
g 14.
e 15.

7. (a) 100 cm, 75 cm

(b) 90 cm, 60 cm, 90 cm, 160 cm

(c) 200 cm, 95 cm, 70 kg. 76 cm

8. 105 cm, 90 cm, 96 cm, 190 cm

10. Exponents are fun!

(a) $(\frac{2}{3})^4$

(b) $(\frac{1}{2})^2$

(c) $(\frac{7}{3})^1$ or $(\frac{7}{3})$

(d) $(\frac{-1}{3})^4$

(e) $(-8)^5$

(f) $(\frac{1}{10})^7$

(g) $(\frac{-2}{7})^3$

(h) $(\frac{15}{8})^5$

(i) $(\frac{-1}{4})^6$

(j) $(\frac{6}{5})^3$

Objective No. 6

1. Let's Simplify

(a) 8^{14}

(b) $a^{7} \times x^{5}$

(c) $h^{10} \times k^{8}$

(d) $2^{17} \times b^{10}$

(e) $4^{14} \times z^{6} \times 3^{12}$

(f) $-m^{18} \times n^{14}$

(g) $b^{15} \times x^{13}$

(h) $7^{18} \times 15^{10}$

(i) $100^{6} \times c^{5}$

(j) $10^{7} \times y^{11} \times 8^{3}$

2. Let's Get Simple Again

(a) $a^{-3} \times b^{-10}$

(b) $6^{0} \times 10^{6}$ or 10^{6}

(c) $z^{5} \times m^{-9}$

(d) -10^{34}

(e) $\frac{5}{4}^{-5}$

(f) $\frac{7}{3}^{3}$

(g) $\frac{5}{8}^{3}$

(h) $y^{0} \times z^{-18}$ or z^{-18}

(i) 15^{-2}

(j) 100^{1} or 100

3. Can you find the title to this picture? "A Blind Date"

(a) x^{2}

(b) x^{8}

(c) x^{7}

(d) x^{0}

(e) x^{4}

(f) x^{5}

(g) x^{1}

(h) x^{4}

(i) x^{6}

4. (a) 2^{2}

(b) 8^{2}

(c) n^{-1}

(d) x^{1} or x

(e) $n^{2} \times n^{-3}$

(f) $a^{0} \times b^{4}$ or b^{4}

(g) 15^{-6}

(h) $y^{-6} \times z^{15}$

(i) $a^{3} \times b^{-2} \times c^{2}$

(j) $x^{1}y^{1}z^{1}$ or xyz

Objective No. 6

5. Why do radio announcers have small **hands**? "Wee paws for identification."

$n = 7^{-5}$

$c = 2^{-8}$

$d = n^{4}$

$f = (\frac{2}{3})^{12}$

$r = -y^{-11}$

$w = 2^{9} \text{ x } n^{-3}$

$p = (\frac{1}{2})^{1}$

$e = z^{24}$

$w = b^{16}$

$s = 9^{28}$

$i = 4^{2}$

$t = x^{12}$

$o = 17^{-5}$

$a = z^{-4}$

6. Finding the value:

(a) 8^{3}

(b) $\frac{625}{49}$

(c) $\frac{36}{27}$ or $\frac{4}{3}$

(d) $\frac{-125}{16}$

(e) $\frac{1}{36\ 000}$

(e) $\frac{3375}{625}$ or $\frac{131}{25}$

(f) $\frac{343}{20\ 736}$

(g) $\frac{2500}{6561}$

(h) $\frac{4913}{512}$

(j) $\frac{495\ 616}{2401}$

7. Let's Tackle Some Toughies:

(a) $\frac{1}{4}$

(b) 1 000 000

(c) $\frac{1}{625}$

(d) 225

(e) $\frac{1}{216}$

(f) $\frac{1}{125}$

(g) 144

(h) 81

(i) 1

(j) $\frac{9}{196}$

RATIONAL NUMBERS

LEVEL 9

UNIT I

CONTENTS

Unit I - Rational Numbers

PAGE

OBJECTIVE 3: Solve and verify conditions for equality and inequality. 543

a. $A + x = B$

b. $Ax = B$

c. $Ax + B = c$

d. $\frac{X}{A} = \frac{B}{C}$

e. $A(x + b) = C$

f. $Ax + Bx = C$

g. $Ax + B = Cx + D$

*h. $A(x + b) + CX = D$

*i. $A(x + b) + C(x + d) = E$

*j. $\frac{x + A}{B} = \frac{x + C}{D}$

*k. $\frac{A}{B}x + \frac{C}{D} = E$

*l. $A(x + b) = C(x + D)$

Note: Emphasis should be placed on conditions of the type (a) = (g).

OBJECTIVE 7: Solve problems which require the use of a formula. 552

($d = rt$, $c = np$, $a = \frac{x}{n}$, $s = c + o + p$, $i = prt$)

KEY TO EXERCISES 582

EXERCISES: UNIT I OBJECTIVE NO. 3

Try to remember the 3 basic steps in solving an equation.

Form $Ax = B$

STEPS:

1. The terms with the variables must all be moved to one side of the equal sign and those without variables to the other side. To do this, add the additive inverse of the term to be moved, to both sides of the equation.
2. If there is more than one term on the left or the right hand side, combine them into a single term.
3. Multiply both sides of the equation by the reciprocal of the number in front of the variable.

REMEMBER !

When you perform an operation on one side of an equation, you must perform the same operation on the other side ! !

A. There are several different forms which an equation can have. Some of these forms do not require all of the steps for solving, some require all three, and some require an additional step first. We will now study some of these basic forms of equations.

1. a. $3x = 12$

$$\boxed{\frac{1}{3}} \times 3x = \boxed{\frac{1}{3}} \times 12$$

$$x = 4$$

Multiply both sides by $\frac{1}{3}$

NOW CHECK

$3x = 12$

$3(4) = 12$

$12 = 12$

STEP 1 & 2 are not required in this equation. Begin at Step 3

b. $\frac{2}{3}x = 6$

$$\boxed{\frac{3}{2}} \times \frac{2}{3}x = \boxed{\frac{3}{2}} \times 6$$

$$x = 9$$

Multiply both sides by $\frac{3}{2}$

NOW CHECK

$\frac{2}{3}x = 6$

$\frac{2}{3}(9) = 6$

$6 = 6$

You should change decimal numbers in front of the variable to fractions.

c. $0.5x = 8$

$\frac{1}{2}x = 8$

$$\boxed{\frac{2}{1}} \times \frac{1}{2}x = \frac{2}{1} \times 8$$

$$x = 16$$

NOW CHECK

$0.5x = 8$

$0.5(16) = 8$

$8 = 8$

Always check your answer to see if it makes the equation true !

2. Solve the following equations and check you solution by substituting in the equation.

A.

✓a. $4x = 36$

✓b. $2x = 56$

✓c. $\frac{3}{4}x = 15$

d. $^-7x = 56$

e. $\frac{7}{8}x = 49$

f. $0.75x = 15$

B. Examples: Form $A + x = B$

1. $6 + x = 13$

$$\textcircled{^-6} + 6 + x = 13 + \textcircled{^-6}$$

$$x = 7$$

STEP 1
Add $^-6$ to both sides

CHECK

$$6 + x = 13$$

$$6 + (7) = 13$$

$$13 = 13$$

Since there is no number in front of "x", step 3 is not necessary.

2. $^-14 + x = 16$

$$\textcircled{^+14} + {}^-14 + x = 16 + \textcircled{^+14}$$

$$x = 30$$

STEP 1
Add $^+14$ to both sides

CHECK

$$^-14 + x = 16$$

$$^-14 + 30 = 16$$

$$16 = 16$$

3. $\frac{3}{4} + x = \frac{7}{8}$

$$\boxed{\frac{-3}{4}} + \frac{3}{4} + x = \frac{7}{8} + \boxed{\frac{-3}{4}}$$

Add $\frac{-3}{4}$ to both sides

$$x = \frac{7}{8} + \frac{-6}{8}$$

$$x = \frac{1}{8}$$

CHECK

$$\frac{3}{4} + x = \frac{7}{8}$$

$$\frac{3}{4} + \frac{1}{8} = \frac{7}{8}$$

$$\frac{6}{8} + \frac{1}{8} = \frac{7}{8}$$

$$\frac{7}{8} = \frac{7}{8}$$

p. 162

1. a. ✓ $x + 7 = 14$

   b. ✓ $x + 12 = {}^{-}15$

   c. $1.7 + x = 2.3$

   d. ✓ $47 + x = {}^{-}47$

   e. $x + {}^{-}14 = {}^{-}22$

   f. $\frac{2}{3} + x = \frac{5}{6}$

   g. $1\frac{3}{4} + x = 4\frac{1}{8}$

   h. $x + {}^{-}12 = 33$

B

C. Form $Ax + B = C$

This form of equation is almost like the last one, except the term with the variable has a number in front of "x".

All three steps have to be used to solve this kind of equation.

Examples:

1. $3x + 7 = 19$

$$3x + 7 + {}^{-}7 = 19 + {}^{-}7$$

$$3x = 12$$

$$\frac{1}{3} \times 3x = \frac{1}{3} \times 12$$

$$x = 4$$

Step 1
Add ⁻7 to both sides

Step 2
Make a single term on each side

Step 3
Multiply both sides by $\frac{1}{3}$

CHECK

$$3x + 7 = 19$$

$$3(4) + 7 = 19$$

$$12 + 7 = 19$$

$$19 = 19$$

2. $12 + \frac{3}{4}x = 27$

$${}^{-}12 + 12 + \frac{3}{4}x = 27 + {}^{-}12$$

$$\frac{3}{4}x = 15$$

$$\frac{4}{3} \times \frac{3}{4}x = \frac{4}{3} \times 15$$

$$x = 20$$

Step 1
Add ⁻12 to both sides.

Step 2
Multiply both sides by $\frac{4}{3}$

CHECK

$$12 + \frac{3}{4}x = 27$$

$$12 + \frac{3}{4}(20) = 27$$

$$12 + 15 = 27$$

$$27 = 27$$

NOTICE

When an equation has 3 terms, as in the form $A + x = B$ and $Ax + B = C$, you should move the term with no variable away from the side of the term with the variable.

0,56

1. Exercises:

a. $6a + 3 = 21$

b. $5y + 4 = 29$

c. $2 + 3n = 20$

d. $3 = 9y + 3$

✓e. $5n + {}^-8 = 32$

✓f. $\frac{3}{4}n + 1\frac{1}{3} = 2\frac{1}{4}$

✓g. $\frac{3}{4} + \frac{1}{2}x = \frac{1}{4}$

h. $4m + 8 = {}^-4$

i. $\frac{1}{6}n + {}^-4 = 2$

j. $4k + {}^-12 = {}^-20$

C.

D. Form $\frac{x}{A} = \frac{B}{C}$

$\frac{1}{2} = \frac{4}{8}$

$1 \times 8 = 2 \times 4$

$8 = 8$

$\frac{3}{5} = \frac{6}{10}$

$3 \times 10 = 5 \times 6$

$30 = 30$

$\frac{2}{3} = \frac{8}{12}$

$2 \times 12 = 3 \times 8$

$24 = 24$

In the above examples, the two fractions are equivalent. Notice that when this is the case, the cross-products are also equal. Therefore, to solve and equation of the form $\frac{x}{A} = \frac{B}{C}$, the first step will be to cross multiply. Then continue with Step 3.

Examples:

1. $\frac{x}{5} = \frac{8}{20}$

$x \times 20 = 5 \times 8$

$20x = 40$

$\frac{1}{20} \times 20x = 40 \times \frac{1}{20}$

$x = 2$

CHECK

$\frac{2}{5} = \frac{8}{20}$

$2 \times 20 = 5 \times 8$

$40 = 40$

FIRST: Cross Multiply

SECOND: Do step 3

Multiply both sides by $\frac{1}{20}$

2. $\frac{12}{x} = \frac{4}{7}$

$12 \times 7 = 4 \times x$

$84 = 4x$

$\frac{1}{4} \times 84 = \frac{1}{4} \times 4x$

$21 = x$

Multiply both sides by $\frac{1}{4}$

CHECK

$\frac{12}{21} = \frac{4}{7}$

$12 \times 7 = 4 \times 21$

$84 = 84$

D

1\.
a. $\frac{x}{5} = \frac{16}{40}$

b. $\frac{6}{x} = \frac{36}{42}$

c. $\frac{12}{28} = \frac{x}{7}$

d. $\frac{15}{30} = \frac{6}{x}$

✓ e. $\frac{2.5}{10} = \frac{25}{x}$

✓ f. $\frac{^-4}{15} = \frac{x}{^-75}$

✓ g. $\frac{^-7}{12} = \frac{x}{36}$

h. $\frac{x}{8} = \frac{4}{^-2}$

E. Form A(x + B) = C

> *Do you remember the DISTRIBUTIVE PROPERTY? We must know it to solve this equation.*

a. $5(x + 2) = 5 \times x + 5 \times 2 = 5x + 10$

b. $3(x - 5) = 3 \times x - 3 \times 5 = 3x - 15$

c. $\frac{1}{2}(2x + 8) = \frac{1}{2} \times 2x + \frac{1}{2} \times 8 = x + 4$

d. $^-4(x + 6) = {^-4} \times x + {^-4} \times 6 = {^-4x} + {^-24}$

> *To use the DISTRIBUTIVE PROPERTY, you must multiply the number in front of the brackets to each term inside of the brackets. After you have done this, the brackets are no longer needed.*

1. Do the following exercises which require the Distributive Property.

✓ a. $2(x + 4) = 2 \times x + \square \times 4 = 2x + \square$

b. $7(x + 3) = \square \times x + \square \times 3 = \square + \square$

✓ c. $4(2x + 5) = 4 \times \square + 4 \times \square = \square + \square$

d. $5(3x + 7) =$

e. $3(3x - 4) =$

f. $^-2(x + 4) =$

g. $^-8(x - 1) =$

✓ h. $^-3(2x + {^-4}) =$

✓ i. $\frac{2}{3}(3x + 9) =$

j. $\frac{3}{4}(2x - 8) =$

E

> *Remember to multiply the number in front to both terms in brackets !*

Examples:

DISTRIBUTIVE PROPERTY

a. $7(x + 3) = 28$

$7 \times x + 7 \times 3 = 28$

$7x + 21 = 28$

Add $^{-}21$

$7x + 21 + {^{-}21} = 28 + {^{-}21}$

$7x = 7$

Multiply by $\frac{1}{7}$

$\frac{1}{7} \times 7x = \frac{1}{7} \times 7$

$x = 1$

CHECK

$7(x + 3) = 28$

$7(1 + 3) = 28$

$7 \text{ x } 4 = 28$

$28 = 28$

b. $^{-}2(2x + 4) = {^{-}12}$

$^{-}2 \times 2x + {^{-}2} \times 4 = {^{-}12}$

$^{-}4x + {^{-}8} = {^{-}12}$

Add

$^{-}4x + {^{-}8} + 8 = {^{-}12} + 8$

$^{-}4x = {^{-}4}$

Multi
by

$^{-}\frac{1}{4} \times {^{-}4x} = \frac{^{-}1}{4} \times {^{-}4}$

$x = 1$

CHECK

$^{-}2(2x + 4) = {^{-}12}$

$^{-}2(2 \times 1 + 4) = {^{-}12}$

$^{-}2(2 + 4) = {^{-}12}$

$^{-}2 \times 6 = {^{-}12}$

2. a. $4(x + 3) = 20$

b. $2(x + 4) = 24$

c. $4(t + 7) = 44$

d. $3(a - 6) = 9$

e. $9(a - 5) = 36$

E.

✓f. $\frac{1}{3}(2x + 3) = 5$

g. $\frac{1}{4}(3x + 4) = 7$

✓h. $^{-}3(2x - 1) = {^{-}15}$

✓i. $3(2x - 3) = {^{-}12}$

j. $2(3d - 10) = 40$

You will have to use the DISTRIBUTIVE PROPERTY first to solve all of these equations.

F. Form Ax + Bx = C

Notice in this form that the terms with variables are already together. All we have to do is add them, (or subtract) and then do Step 3.

$$5x + 2x = 7x$$

$$11x - 3x = 8x$$

$$\frac{2}{5}x + \frac{1}{5}x = \frac{3}{5}x$$

$$^-6x + {}^-4x = {}^-10x$$

To add two terms with variables, just repeat the variable and add the numbers in front. (or subtract)

Examples:

a. $6x + 4x = 50$ *Repeat x Add 6 & 4.*

$10x = 50$

$\frac{1}{10} \times 10x = \frac{1}{10} \times 50$ *Multiply by $\frac{1}{10}$*

$x = 5$

CHECK

$6x + 4x = 50$

$6(5) + 4(5) = 50$

$30 + 20 = 50$

$50 = 50$

Repeat x. Subtract 3 from 7

b. $7x - 3x = 10$

$4x = 10$

$\frac{1}{4} \times 4x = \frac{1}{4} \times 10$ *Multiply both sides by $\frac{1}{4}$*

$x = 2.5$

CHECK

$7x - 3x = 10$

$7(2.5) - 3(2.5) = 10$

$17.5 - 7.5 = 10$

$10 = 10$

Exercises:

1. a. $6x + 2x = 8$

✓b. $^-3x + 5x = {}^-16$

c. $3x + x = 28$

d. $5x - 3x = {}^-12$

F

✓e. $6x + {}^-2x = {}^-32$

f. $10 = 6x + {}^-x$

✓g. $\frac{1}{2}x + \frac{1}{3}x = 15$

h. $2.7x + 1.3x = {}^-16$

G. Conditions for Inequality

All of the forms which we have studied for solving equations can occur in conditions for inequality. The same steps should be followed and the same rules used. There is only one situation which requires a new rule. Look at the following examples.

When both sides were multiplied by positive 3, the inequality remained true.

1. $6 > 4$ (true)

$3(6) > 3(4)$

$18 > 12$ (true)

When both sides were multiplied by $^-3$, the inequality became false. To correct it, we reverse the sign.

2. $6 > 4$ (true)

$^-3(6) > {}^-3(4)$

$^-18 > {}^-12$ (false)

INSTEAD: $^-18 < {}^-12$ (true)

Again, when both sides were multiplied by a pos. number, the inequality remained true.

3. $^-5 < {}^-2$ (true)

$3(^-5) < 3(^-2)$

$^-15 < {}^-6$ (true)

The inequality sign must be reversed again, because we multiplied by a neg. number.

4. $^-5 < {}^-2$ (true)

$^-3(^-5) < {}^-3(^-2)$

$15 < 6$ (false)

$15 > 6$ (true)

RULE

When doing Step 3, if you multiply both sides by a negative reciprocal, you must reverse the inequality sign.

Examples using new rule:

a. $^-2x + 5 > 8$

$^-2x + 5 + {}^-5 > 8 + {}^-5$

$2x > 3$

$\left(\frac{1}{-2}\right) \times -2x < \left(\frac{1}{-2}\right) \times 3$

$x < -1\frac{1}{2}$

CHECK

Let x be $^-3$

$^-2(^-3) + 5 > 8$

$6 + 5 > 8$

$11 > 8$

b. $^-4(x + 5) < 8$

$^-4x + {}^-20 < 8$

$^-4x + {}^-20 + 20 < 8 + 20$

$^-4x < 28$

$\left(\frac{1}{-4}\right) \times {}^-4x > \left(\frac{1}{-4}\right) \times 28$

$x > {}^-7$

CHECK

Let x be $^-4$

$^-4(^-4 + 5) < 8$

$^-4 \times 1 < 8$

$^-4 < 8$

Exercises in solving conditions for inequality: Check all answers.

G

1. $2x > 56$

2. $\frac{7}{8}x < 49$

3. $x + \frac{2}{3} > \frac{3}{3}$

✓4. ${}^-3x + 6 < 9$

5. $4k + 12 > {}^-20$

6. $\frac{-2}{3}x + 4 > {}^-8$

✓7. ${}^-2(x + 3) > 10$

8. ${}^-2(2x + 4) < 12$

✓9. $3(2x - 3) < {}^-12$

10. ${}^-3x + 5x > 16$

11. ${}^-6x + 2x < 8$

12. $2x + 5 > {}^-11$

EXERCISES: UNIT I OBJECTIVE NO. 7

A. d = rt Distance Formula

d = distance
r = rate
t = time

Examples:

a. Mr. Smith walked a certain distance in 2 hours. If he walked at a rate of 4 km/hr, how far did he walk?

d = rt Rule 1

d = 4(2) Rule 2

d = 8 km Rule 3

Mr. Smith walked 8 km. Rule 4

RULES

1. *Write the formula.*
2. *Replace the letters by the number given.*
3. *Calculate.*
4. *Write the answer complete with units.*

r = 4 km/hr
t = 2 hours
d = ?

b. Betty ran the 100 m in 10 seconds, what is her rate of speed?

d = rt Rule 1

100 = r(10) Rule 2

$(\frac{1}{10})(100) = r(10)(\frac{1}{10})$ Rule 3

10 m / sec.

Betty's rate of speed is 10m/sec. Rule 4

Try the following distance problems. The first one is done for you.

1. Bobby Orr can skate at a rate of 40 km/hr. If he skates 200 km, how long will it take him?

$$d = rt$$

$$(200) = (40)(t)$$

$$\frac{1}{40}(200) = (40)(t)(\frac{1}{40})$$

$$5 = t$$

Bobby Orr would skate the 200 km in 5 hrs.

2. Hank Arron can hit a baseball 125 m in 5 sec. At what rate is the baseball moving.

$$d = rt$$

3. Using d = rt, fill in the following table.

DISTANCE	RATE	TIME	MY WORK
100 cm	20 cm/s	5 s	$d = rt$ $d = (20)(5)$ $d = 100$ cm
	300 km/hr	2.5 hr.	
1 000		5 hr.	
600 cm		1.5 min.	
225 m	15 m/s		
2 500 km	40 km/hr.		
100 km		$\frac{5}{3}$ hr.	
	60 km/hr	41.67 hr.	
2 000 m	50 m/hr		

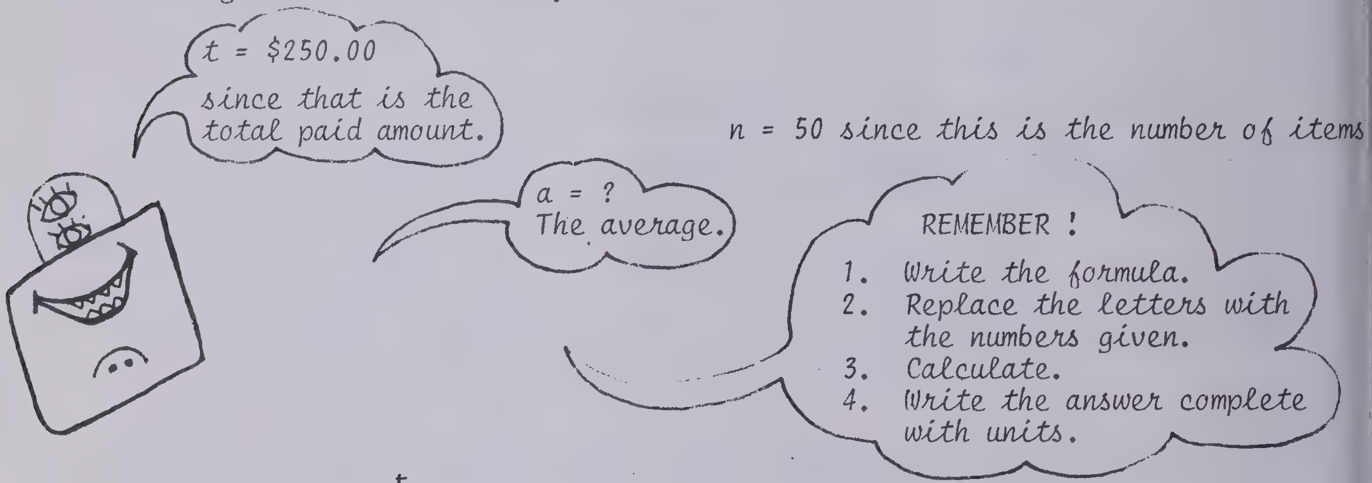
p. 563 B

B. Average Formula $a = \frac{t}{n}$

a = average
t = total
n = number of items

Complete the following. (The first two are done for you.)

1. Bobby Hull purchased 50 hockey sticks for $250.00. What was the average cost of each hockey stick?


t = $250.00
since that is the total paid amount.
n = 50 since this is the number of items
a = ?
The average.
REMEMBER !
1. Write the formula.
2. Replace the letters with the numbers given.
3. Calculate.
4. Write the answer complete with units.

$$a = \frac{t}{n}$$

$$a = \frac{250.00}{50}$$

$a = \$5.00$ The average cost is $5.00 per stick.

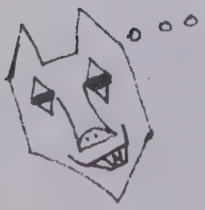
2. Guy Lafleur scored 128 points in a regular 80 game schedule. What is his average number of points per game?

$$a = \frac{t}{n}$$

$$a = \frac{128}{80}$$

$a = 1.6$ The average number of points per game is 1.6 points.

√3. The St. Paul Rockets scored an average of 5.4 goals per game during the 1975-76 Hockey Season. If they played 25 games, how many goals did they score during the whole season?



That's easy. Can you finish it?

$$a = \frac{t}{n}$$

4. The average number of books in several schools in Edmonton works out to 10 321. If there are 113 531 books in all, how many schools are there involved?

REMEMBER !

1. *Write the formula*
2. *Replace the letters with the numbers given.*
3. *Calculate.*
4. *Write the answer complete with units.*

5. Your principal travelled 1 800 km at an average speed of 90 km/hr. How many hours did he take to travel the 2 000 km?

✓ 6. Over the last 6 weeks, you have spent $30.00. What is the average amount you spend each week?

✓ 7. Your school board spends an average of $10.00 per student on Physical Education equipment each year. If there are 452 students in the school, what is the total amount spent on Physical Education equipment?

C. Cost formula $C = np$

C = total cost
n = number of items
p = cost (or price) of one item.

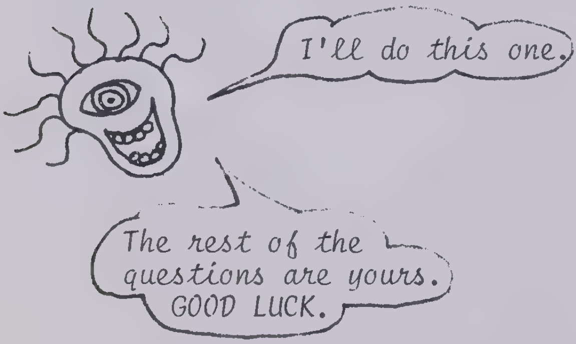
Complete the following. The first two are done for you.)

1. Your Physical Education teacher purchased a dozen badminton rackets for \$8.45 each. What is the total cost.

$$C = np$$
$$C = 12(8.45)$$
$$C = \$101.40$$

The total cost is \$101.40

2. How many used comic books can John purchase if each comic book costs 11 cents and John has $1.43?


I'll do this one.
The rest of the questions are yours. GOOD LUCK.

$$C = np$$
$$1.43 = n(0.11)$$
$$\left(\frac{1}{0.11}\right)(1.43) = n(0.11)\left(\frac{1}{0.11}\right)$$
$$13 = n$$

John can buy 13 comic books.

3. The Edmonton Oilers purchased 500 hockey sticks for the beginning of the 1976 Season. They paid a total of \$1 625.00. What is the price of each stick?

$$C = np$$

4. The Calgary School Board purchases 253 calculators to put into their high school mathematics classrooms. They paid \$35.25 for each calculator. What was the total cost?

$$C = np$$

1. *Write the formula*
2. *Replace the letters with numbers.*
3. *Calculate.*
4. *Write the answer complete with units.*

5. The mathematics department purchased 50 calculators to help the students check their work. If they paid out a total of \$2 255.00, what is the price of each calculator?

6. After a week of work you received \$50.05. You immediately purchased 11 records spending all your money. What was the price of each record?

7. The school Snack Bar purchased pop at \$5.80 per case. If they paid out \$145.00 how many cases did they buy?

D. Selling Formula $S = c + o + p$

S = selling price of article.
c = cost price of article.
o = overhead cost
p = profit desired

Complete the following. The first one is done for you.

1. The School Snack Bar students purchased juice at 10 cents per tin. If they desire to make a profit of 4 cents per tin, and the overhead cost is 1 cent per tin, what is the selling price?

The 10 ¢ represents the cost price = c

The 4¢ represents the profit = p

The 1¢ represents the overhead = o

Therefore

$S = c + o + p$
$S = 10 + 1 + 4$
$S = 15$

The selling price is 15¢

2. The School Students' Union purchased 100 school crests for \$300.00. The mailing charges cost the students' union \$5.40 and 0.50¢ for a receipt book. If they sell each crest for \$5.00, what will the total profit be?

THIS ONE REQUIRES SOME EXTRA THINKING !

c =
total cost price

o = ____ + ____
total overhead

S = 100 x ____

S =
total selling price

p = ?
total profit

S = c + o + p

= + + p

3. Complete the following table.

S	C	O	P	MY WORK
329.50	\$302.00	\$20.00		s = c + o + p
\$203.21		\$10.23	\$50.00	
	\$73.00	\$1.62	\$10.25	
\$135.99	\$121.32		\$11.00	

E. Interest formula i = prt

i = interest in dollars
p = principal in dollars
r = rate of interest as percent
t = time in years

1. You have just been paid \$1 000.00 for having perfect attendance for the 1975-76 school year. If you put the money in a savings account for two years, and the bank pays 9% interest how much interest in dollars will you have at the end of 2 years?

p = \$1 000.00
t = 2 years

$r = \frac{9}{100}$ since the rate is 9%. Remember to put the percent over 100.

i = prt

$i = 1000 \times \frac{9}{100} \times 2$

i = \$180

I will have \$180.00 interest at the end of 2 years.

2. Complete the following table.

PRINCIPAL	RATE	TIME	INTEREST	MY WORK
\$60.00	5%	1 year		$i = prt$
\$130.00	$5\frac{1}{2}\%$	2 years		
\$73.20	7%	$1\frac{1}{2}$ years		
\$1 080.00	6%	15 months		
\$580.30	8%	4 years		

F.

REMEMBER:

Distance formula $d = rt$
Average formula $a = \frac{t}{n}$
Cost formula $c = np$
Selling Formula $s = c + o + p$
Interest formula $i = prt$

How does a barber make money?

DIRECTIONS

1. Work each question below.
2. Find your answer to each question in the correct box at the end of the questions.
3. In the box with the correct answer, write the letter that you will find at the beginning of the question.

Read each question carefully.

Y What is the cost of 10 basketballs if each ball cost \$36.25 ?

T You have 4 mathematics tests and scored 48%, 56%, 62% and 70%. What is your average mark?

S What is the interest on \$1 500.00 invested for 2 years at a rate of 6%?

O Calvin drove to Red Deer from his hometown at an average rate of 80 km/hr in 6 hours. How far is his home town from Red Deer?

G The local baseball team purchased jackets for $10.50 each and sold them to each player for $16.00. If they had an overhead of $1.00 per jacket, what profit did the team make on each jacket?

N The basketball team purchased 12 pairs of running shoes for $180.00. What is the price of each pair?

E You are borrowing $3 000.00 to buy a car. You will pay $450.00 interest at a rate of 5%. How many years will it take you to pay off the loan?

I Flying your new airplane you travelled 630 km in 2.5 hours. What was your average rate of speed?

B Janelle spent an average of $2.20 per week for 13 weeks. How much money did she spend in 13 weeks?

R The school purchased your mathematics book and sold it to you for $8.40. At the end of the year you sold the book to a friend for $9.25 and it cost you $0.20 to sent it to him by mail. What is your profit?

U During the local school track meet you ran the 100 meters in 10.1 seconds. What is your rate of speed?

C What is the interest on $45.00 if you borrow it for 6 months at a rate of 10 percent?

28.60	362.50	✖	2.25	9.9	59	59	252	15.00	4.50	✖	2.25	480	0.65	15.00	3	0.65	180	
		✖								✖								

KEY TO EXERCISES

LEVEL 9

UNIT I

RATIONAL NUMBERS

KEY TO EXERCISES

Rational Numbers

Objective No. 3

A. 2. a. $x = 9$
b. $x = 28$
c. $x = 20$
d. $x = {}^{-}8$
e. $x = 56$
f. $x = 20$

B. 1. a. $x = 7$
b. $x = {}^{-}3$
c. $x = 0.6$
d. $x = {}^{-}94$
e. $x = {}^{-}8$
f. $x = \frac{1}{6}$
g. $x = 2\frac{3}{8}$
h. $x = 45$

C. a. $a = 3$
b. $y = 5$
c. $n = 6$
d. $y = 0$
e. $n = 8$
f. $n = \frac{11}{9}$
g. $x = {}^{-}1$
h. $m = {}^{-}3$
i. $n = 1$
j. $k = {}^{-}2$

D. 1. a. $x = 2$
b. $x = 7$
c. $x = 3$
d. $x = 12$
e. $x = 100$
f. $x = 20$
g. $x = {}^{-}21$
h. $x = {}^{-}16$

E. 1. a. 2, 8
b. 7, 7, 7x, 21
c. 2x, 5, 8x, 20
d. $15x + 35$
e. $9x - 12$
f. ${}^{-}2x + {}^{-}8$
g. ${}^{-}8x - {}^{-}8$
h. ${}^{-}6x + 12$
i. $2x + 6$
j. $1\frac{1}{2}x - 6$

2. a. $x = 2$
b. $x = 8$
c. $t = 4$
d. $a = 9$
e. $a = 9$
f. $x = 6$
g. $x = 1$
h. $x = 3$
i. $x = {}^{-}\frac{1}{2}$
j. $d = 10$

F. 1. a. $x = 1$
b. $x = {}^{-}8$
c. $x = 7$
d. $x = {}^{-}6$
e. $x = {}^{-}8$
f. $x = 2$
g. $x = 18$
h. $x = {}^{-}4$

G. 1. $x > 28$
2. $x < 56$
3. $x > \frac{1}{3}$
4. $x > {}^{-}1$
5. $k > {}^{-}8$
6. $x < 18$
7. $x < {}^{-}8$
8. $x > {}^{-}5$
9. $x > {}^{-}\frac{1}{2}$
10. $x > 8$
11. $x > {}^{-}2$
12. $x > {}^{-}8$

Key to Exercises:

Objective No. 7

A. 1. Done for student
2. 25 m/s
3. 100 cm
750 km
200 km/hr
400 cm/min
15 s
62.5 hr.
60 km/hr.
2 500.20 km
40 hr.

B. 1. $5.00
2. 1.6
3. 135
4. 11
5. 20 hours
6. $5.00
7. $4 520.00

C. 1. $101.40
2. 13
3. $3.25
4. $8 918.25
5. $45.10
6. $4.55
7. 25 cases

D. 1. 15 cents
2. $194.10
3. $7.50
$142.98
$84.87
$3.67

E. 1. $180.00
2. $3.00
$14.30
$7.69
$81.00
$185.70

F. ANSWER TO RIDDLE: By cutting corners.

GEOMETRY

LEVEL 9

UNIT II

CONTENTS

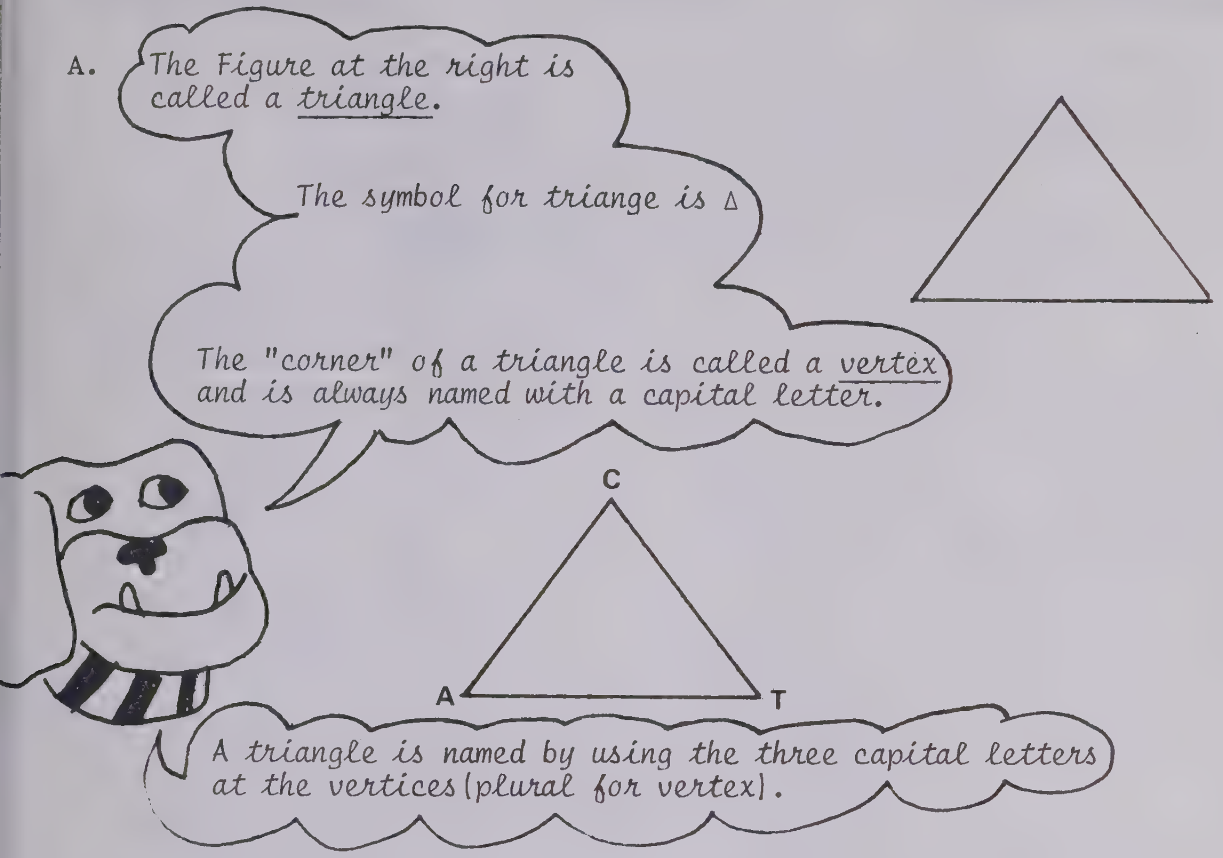
Unit II - Geometry

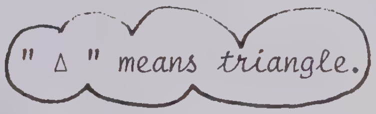
PAGE

OBJECTIVE NO. 3: Label triangles by using opposite vertices ....

KEY TO EXERCISES ....

A.


The Figure at the right is called a triangle.
The symbol for triange is Δ
The "corner" of a triangle is called a vertex and is always named with a capital letter.
C
A
T
A triangle is named by using the three capital letters at the vertices (plural for vertex).

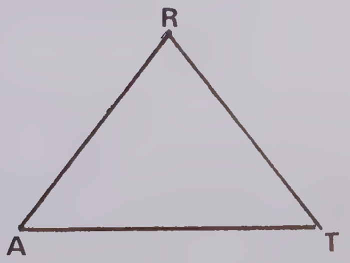

" Δ " means triangle.

Examples:

The above triangle may be named as:

Δ CAT   Δ ATC   Δ TCA

Δ TAC   Δ ACT   Δ CTA



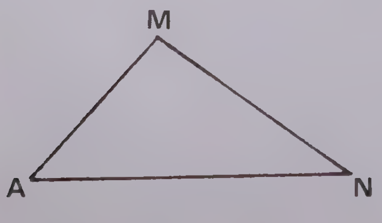
The triangle at the right may be named as:

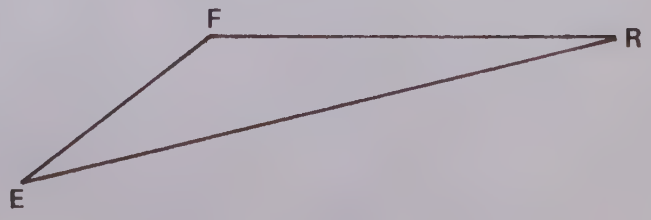
Δ RAT   Δ ATR   Δ TRA

Δ TAR   Δ ART   Δ RTA

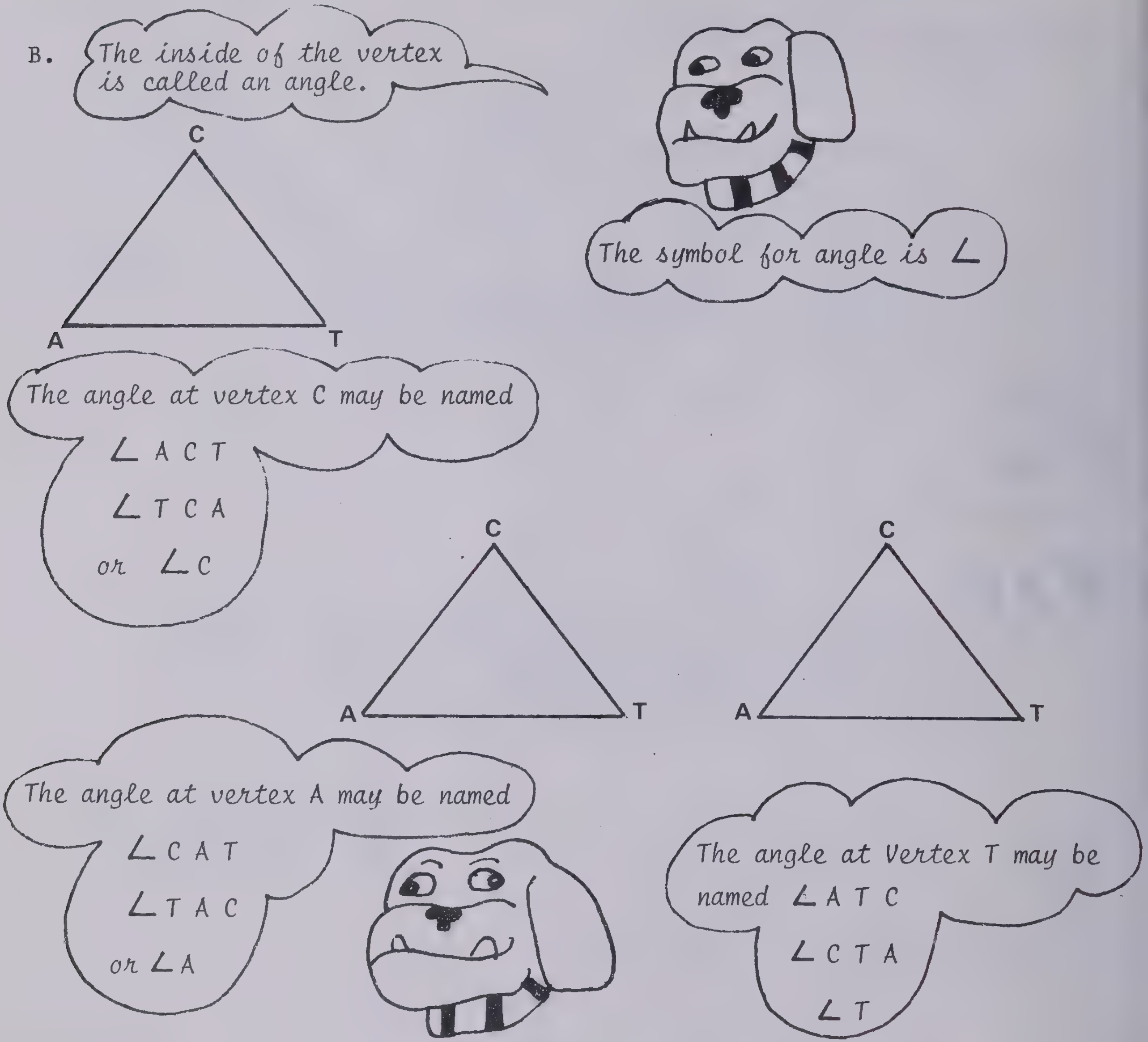
Now try these triangles:

1. In each of the triangles below give six names for each:

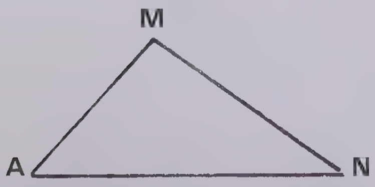


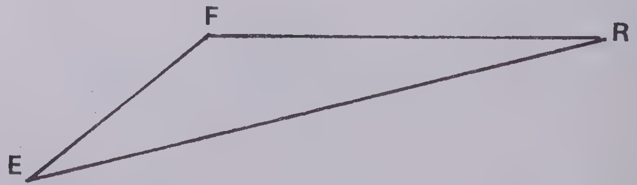


B.

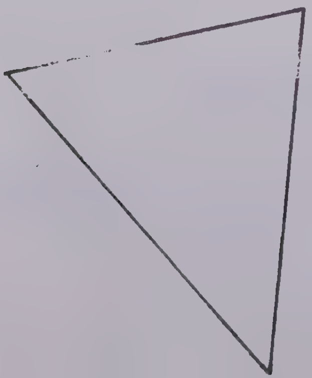

The inside of the vertex is called an angle.
The symbol for angle is ∠
C
A
T
The angle at vertex C may be named ∠ACT ∠TCA or ∠C
C
A
T
C
A
T
The angle at vertex A may be named ∠CAT ∠TAC or ∠A
The angle at Vertex T may be named ∠ATC ∠CTA ∠T

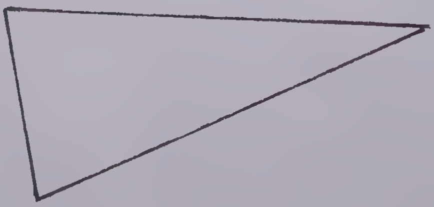
1. In each of the triangles below give three names for each angle:





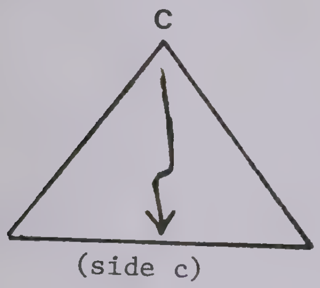
2. Pick letters to put on each triangle below. Give 3 names for each angle.

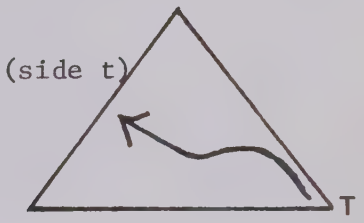


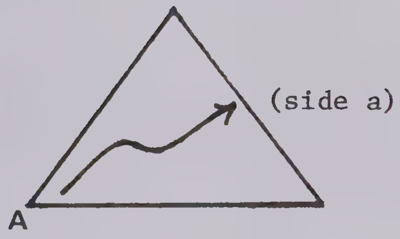


C. *Any side of a triangle is named by using the small letter that matches the capital letter at the opposite vertex.*

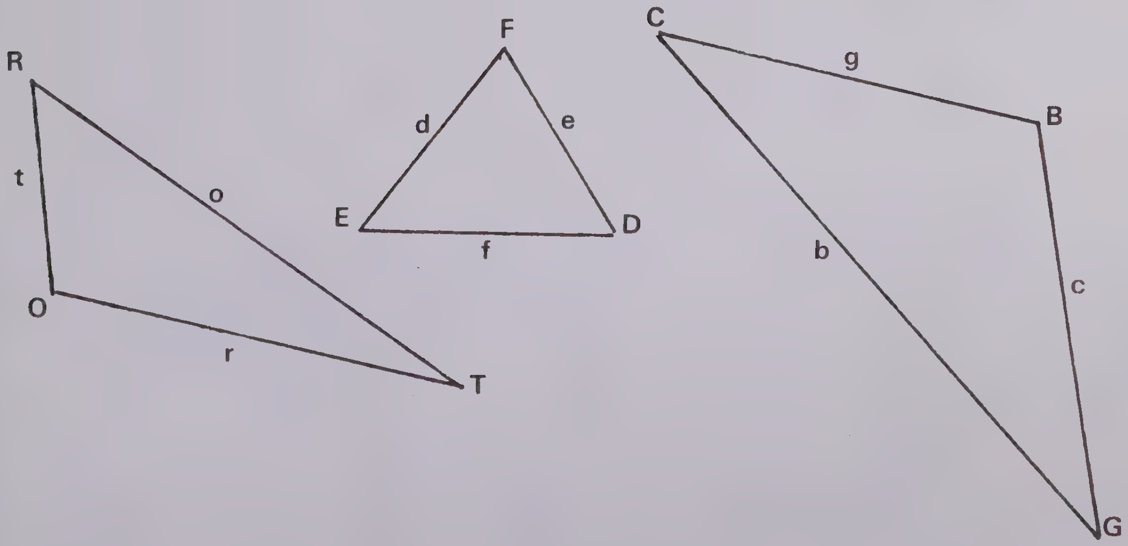
EXAMPLES:



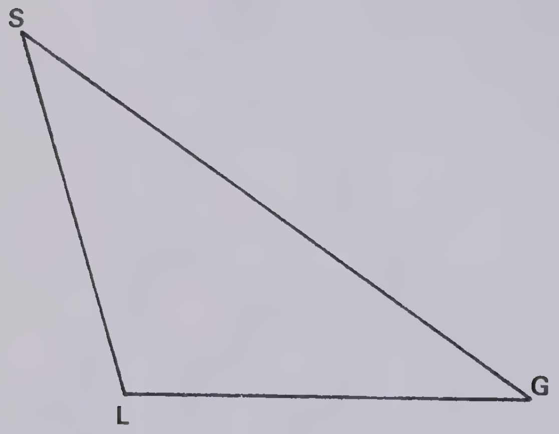


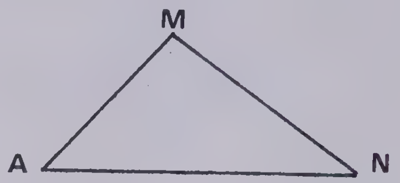


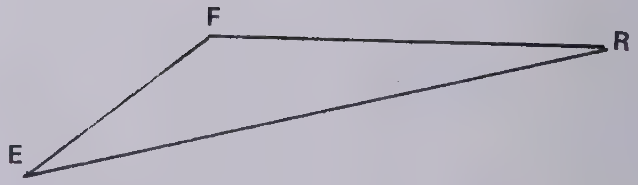
1. In each triangle below circle the letter which names a side.

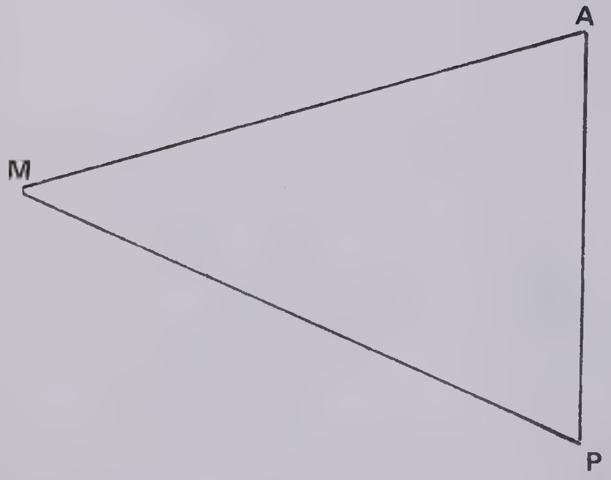


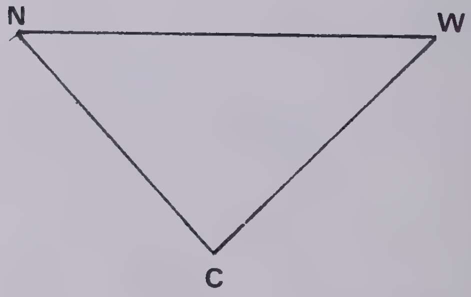
2. Name the sides of the triangles below.

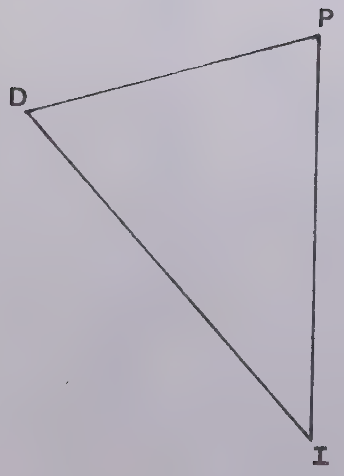


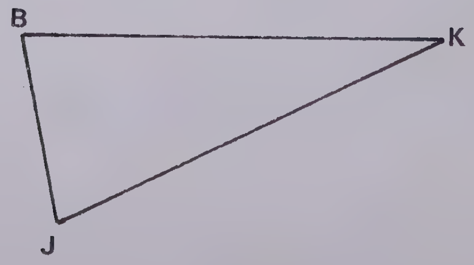






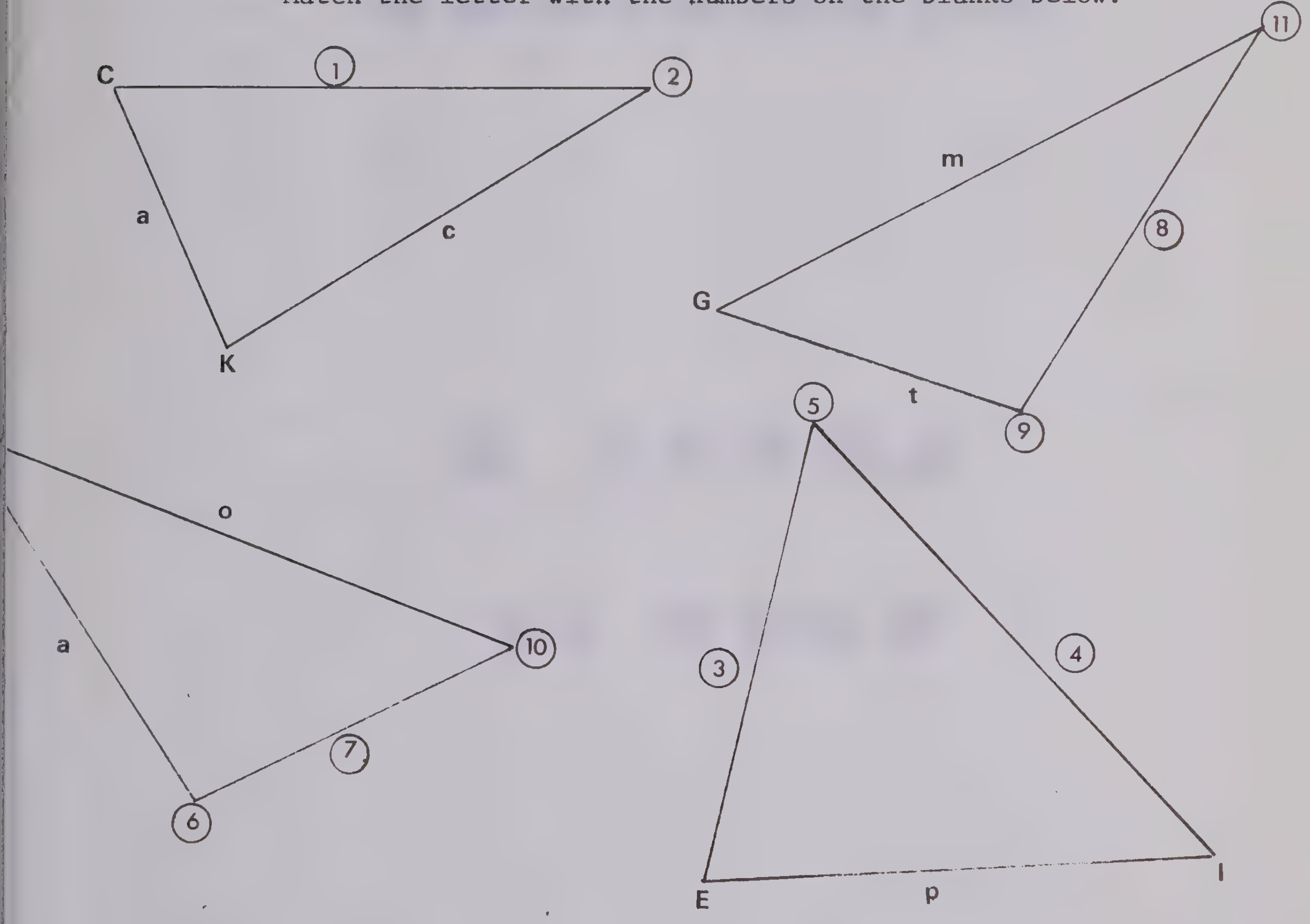




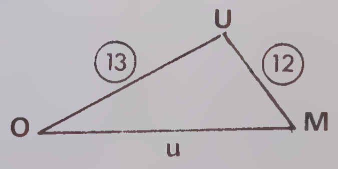


3. *What is a "Chinese Girl Watcher" called?*

DIRECTIONS: Fill in the missing letters on the triangles below. Match the letter with the numbers on the blanks below.



HINT: If the side is named "b", then what would the opposite vertex be named ?



____ ____ ____ ____ ____ ____ ____ ____ ____ ____

2 5 4 1 3 7 8 11 12 13

KEY TO EXERCISES

LEVEL 9

UNIT II

GEOMETRY

KEY TO EXERCISES

Geometry

Objective No. 3

A. 1. MAN NMA FER FRE
NAM ANM REF RFE
AMN MNA ERF EFR

B. 1. ∠AMN ∠MAN ∠MNA ∠EFR ∠FER ∠FRE
∠NMA ∠NAM ∠ANM ∠RFE ∠REF ∠ERF
∠M ∠A ∠N ∠F ∠E ∠R

C. 1. t; o; r d; f; e g; c; b

2. n; a; m r;e; f g; l; s p;m;a w;c; n p;i;d k;j;b

3. ANSWER TO RIDDLE: A Peking Tom

ALGEBRAIC EXPRESSIONS

LEVEL 9

UNIT IV

CONTENTS

Unit IV - Algebraic Expressions

PAGE

OBJECTIVE 1: Identify constants, variables, terms coefficients and factors in an expression. ....

OBJECTIVE 2: Identify the polynomials as to monomial, binomial, and trinomial. ....

OBJECTIVE 3: State the degree of a polynomial and write a polynomial in standarm form. (Limit: one variable) ....

OBJECTIVE 4: Evaluate polynomials by substituting for the variable. ....

OBJECTIVE 5: Identify like and unlike terms, (similar terms). ....

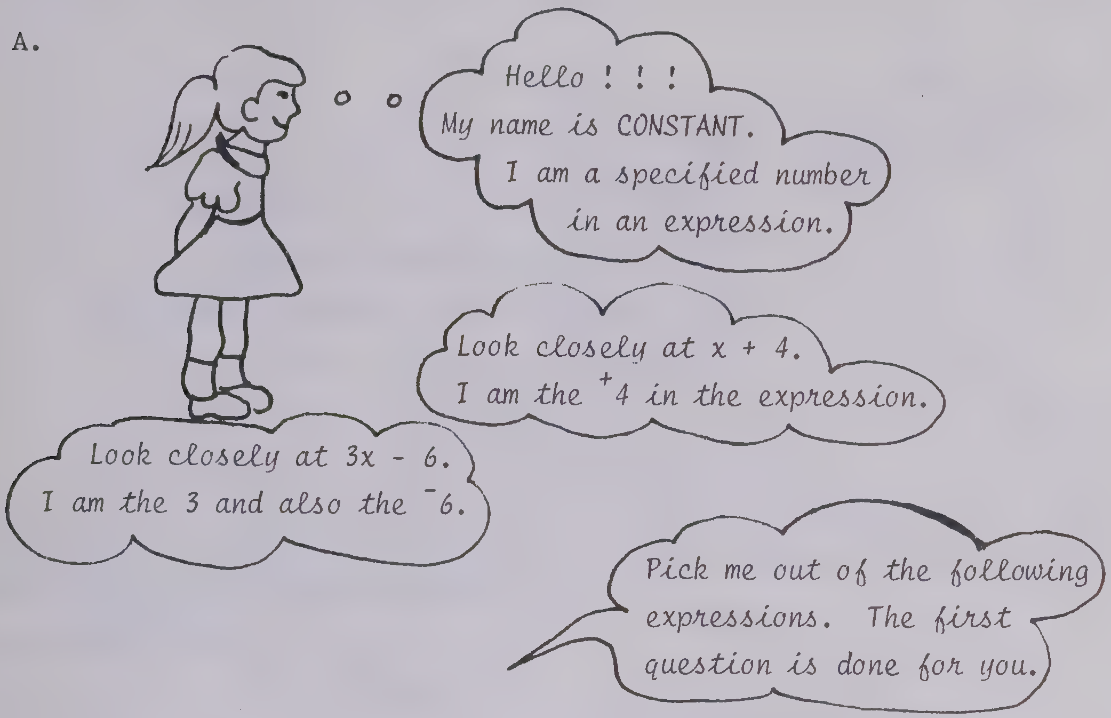
OBJECTIVE 6: Find the sum and difference of ....

OBJECTIVE 7: Find the sum of polynomials. (Limit: trinomials) ....

KEY TO EXERCISES ....

EXERCISES: UNIT IV OBJECTIVE NO. 1

A.


Hello ! ! !
My name is CONSTANT.
I am a specified number in an expression.
Look closely at $x + 4$.
I am the $^{+}4$ in the expression.
Look closely at $3x - 6$.
I am the 3 and also the $^{-}6$.
Pick me out of the following expressions. The first question is done for you.

EXPRESSION	CONSTANTS
1. $x - 5$	$^{-}5$
2. $2x + \frac{1}{3}$	2 and $\frac{1}{3}$
3. $\sqrt{3x^2} - \frac{5}{6}x + 7$	____, ____ AND ____
4. $\frac{^{-}3}{2}x + 9y$	____ and ____
5. $12x + 6y - 3$	____, ____ and ____
6. $-5x + \frac{2}{3} - \frac{1}{2}y + 3a$	____, ____, ____ and ____

B.

Hi !

My name is VARIABLE, and I am a placeholder for a number; usually named by a letter.

Look closely at $x + 4$
I am the x in the expression.

I am the x and y in the expression
$3x - \frac{2}{3}y$

Pick me out of the following expressions.
The first question is done for you.

EXPRESSION	VARIABLE(S)
1. $2a - 5$	a
2. $6a^2 - 3b + c$	_____, _____ and _____
3. $6x^2 - 3x + 4$	_______
4. $2m - 3a$	_____ and _____
5. $7y^2 + 3x - 2a + 7$	_____, _____ and _____
6. $\frac{2}{3}m - \frac{1}{2}n + \frac{3}{5}a$	_____, _____ and _____

C.

I'm TERM.

I can be a number, a variable, a product, or a quotient.

For example: I could be the number 5, the variable x, the product 3x, or the quotient $\frac{2x}{3y}$

I am separated from other terms with an add (+) or a subtract(-) sign.

See if you can determine the number of terms in each expression below. The first one is done for you.

1. EXPRESSION	NUMBER OF TERMS
a. $6x - 7$	2
b. $\frac{2x^2}{5} - 7x + 3$	
c. $(2x)(3y)$	
d. $\frac{4a}{3b} + 2x$	
e. $3x^4 - 5x^3 + 6x^2 - 7x + 2$	
f. $x - 10 + y$	

2. Now name each of the terms in the questions above. The first one is done for you.

a. $6x, {}^-7$

b. ______

c. ______

d. ______

e. ______

f. ______

D.

My name is NUMERICAL COEFFICIENT.
I am the numerical factor of a term.

I am the 5 in the term 5ab
I am the 1 in the term m
I am the $^-3$ in the term $^-3x^2y^2$
I am the $\frac{-2}{3}$ in the term $\frac{-2}{3}a^2b$

Pick me out of the following terms. The first one is done for you.

	TERM	NUMERICAL COEFFICIENT
1.	6ab	6
2.	$^-\frac{2}{5}x^2y^3$	________
3.	c^3y^4	________
4.	2.5 mn^2	________
5.	$\frac{1}{2}$ abc	________
6.	$^-5.6$ fg	________

Just call me COEFFICIENT and I'll know you mean my full name NUMERICAL COEFFICIENT.

E.

Howdy ! !
My name is FACTOR. I am any number or variable that is used to form a product.

For the product 24, I could be 2,3,4,6,8 or 12.
For the product 5y, I am the 5 or the y.

Write in the blank the correct factor. The first one is done for you.

1. $36 = \underline{\quad 4 \quad} \times 9$
2. $10x = 2 \times$ ________
3. $3x^3 = 3x \times$ ________
4. $4x^4y^5 = 2x^2 \times$ ________
5. $26x^3 =$ ________ $\times 2x$
6. $25x^3y^2a =$ ________ $\times \underline{5xy^2}$

EXERCISES: Cont'd UNIT IV OBJECTIVE NO. 1

F. DIRECTIONS:
1. Read the statement in Part 1.
2. Select the expression from Part 2 which would be a solution to the statement in Part 1.
3. Write the expression from Part 2 in the blank beside the statement in Part 1.

PART 1

a. The constant is $^{-}\frac{2}{3}$ ____________________

b. The coefficient is 16 ____________________

c. An expression with three terms ____________________

d. Contains the factors 5 and 6 ____________________

e. Contains the variables x and y ____________________

f. The coefficient is 17 ____________________

g. Contains the variables b and a ____________________

h. Contains the factors 2, 3, a^2, f and c ____________________

i. An expression with 2 terms and variables m and c ____________________

j. An expression with constants 2, $^{-}0.6$ and $\frac{3}{5}$ ____________________

PART 2 LIST OF EXPRESSIONS

$2x - 5a + 3s$

$16x^2h$

$^{-}\frac{3}{4}a + 2b$

$6a^2fc$

$3m - 4c$

$17x^2mn$

$^{-}\frac{2}{3}x$

$2d - 0.6e - \frac{3}{5} + x$

30

$2x - 0.6y^2$

KEY TO EXERCISES

LEVEL 9

UNIT IV

ALGEBRAIC EXPRESSIONS

KEY TO EXERCISES

Algebraic Expressions

Objective No. 1

A. 1. $^{-}5$
2. 2 and $\frac{1}{3}$
3. $\sqrt{3}$, $^{-}\frac{5}{6}$ and 7
4. $^{-}\frac{3}{2}$ and 9
5. 12, 6 and $^{-}3$
6. $^{-}5$, $\frac{2}{3}$, $^{-}\frac{1}{2}$ and 3

B. 1. a
2. a, b and c
3. x
4. m and a
5. y, x and a
6. m, n and a

C. 1. a. 2
b. 3
c. 1
d. 2
e. 5
f. 3

2. a. $6x$, $^{-}7$
b. $\frac{2x^2}{5}$, $^{-}7x$, 3
c. $6xy$
d. $\frac{4a}{3b}$, $2x$
e. $3x^4$, $^{-}5x^3$, $6x^2$, $^{-}7x$, 2
f. x, $^{-}10$, y

E. 1. 4
2. $5x$
3. x^2
4. $2x^2y^5$
5. $13x^2$
6. $5x^2a$

D. 1. 6
2. $^{-}\frac{2}{5}$
3. 1
4. 2.5
5. $\frac{1}{2}$
6. $^{-}5.6$

F. a. $^{-}\frac{2}{3}x$
b. $16x^2h$
c. $2x - 5a + 3s$
d. 30
e. $2x - 0.6y^2$
f. $17x^2mn$
g. $^{-}\frac{3}{4}a + 2b$
h. $6a^2 fc$
i. $3m - 4c$
j. $2d - 0.6e - \frac{3}{5} + x$

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